TREES and SHRUBS OF THE ROCKY MOUNTAIN REGION

BURTON O. LONGYEAR

M. A. Manson
1247 Downing St
Denver Colo

I. COLORADO BLUE SPRUCE

A group in Rocky Mountain National Park

TREES AND SHRUBS
OF THE
ROCKY MOUNTAIN REGION

WITH KEYS AND DESCRIPTIONS FOR
THEIR IDENTIFICATION

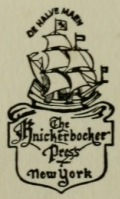
BY

BURTON O. LONGYEAR, B.S., M.F.
Associate Professor of Forestry,
State Agricultural College of Colorado

Illustrated with One Hundred and Twenty-eight
Pen Drawings by the Author and
Nine Colored Plates

G. P. PUTNAM'S SONS
NEW YORK AND LONDON
The Knickerbocker Press
1927

Copyright, 1927
by
Burton O. Longyear



Made in the United States of America

Dedicated

TO THE MEMORY OF

DR. WILLIAM J. BEAL

SCIENTIST,
AUTHOR, TEACHER, FRIEND

PREFACE

THIS volume is intended to meet in part the increasing demand for field books of a non-technical character which will provide a ready means of identifying the plant life of the Rocky Mountain Region. The trees and shrubs constitute the most prominent part of our flora which, together with their importance in making our mountains beautiful, in furnishing a home for wild life and in supplying timber and a protective cover to the mountain slopes, makes them of great interest to the public.

While the book has been planned primarily to assist persons who have little or no botanical training it is hoped that it will be helpful also to teachers of nature study and botany in our public schools. Forest officers, park rangers and guides should likewise find it useful in their duties and a means of increasing their powers of service to the public.

It was deemed best to confine the work to the more clearly defined species and to omit

those about which botanists appear to disagree. For persons who desire to make a more technical study of our flora there are manuals which are suited to that purpose.

All of the species of trees and shrubs described in the book occur in the region from central New Mexico to Canada along both sides of the Rocky Mountains.

The nomenclature used is based largely upon that of the *New Manual of Rocky Mountain Botany* by Coulter and Nelson, 1909, for strictly Rocky Mountain species, and upon the seventh edition of Gray's *Manual*, 1908, for species included in that volume.

The author gratefully acknowledges favors from the following persons in the way of advice or in the supplying of material and information: The late Mr. Ellsworth Bethel, Director of Natural History, State Museum, Denver, Colorado; Mr. George E. Osterhout, New Windsor, Colorado; Dr. Aven Nelson, State University of Wyoming, Laramie, Wyoming. Especially am I indebted to Professor F. Schuyler Mathews, Cambridge, Massachusettes, for constructive criticism and helpful suggestions.

The publications of Dr. P. A. Rydberg, New York Botanical Garden, Dr. Frances Ramaley, State University of Colorado,

Boulder, Colorado, Professor E. O. Wooton, State College, New Mexico, have been invaluable in the preparation of the manuscript.

BURTON O. LONGYEAR.

FORT COLLINS, COLO.,
October, 1926.

INTRODUCTION

THE Rocky Mountain region has always held a deep and varied interest for mankind. Here have been drawn the explorer and the prospector in search of adventure or of wealth. Here too have come the herder, the lumberman, and the farmer to utilize and develop the great resources of land and forest. Within this area the artist and the scientist have alike been charmed with its grandeur and beauty, or fascinated with its wonders of nature. Traveller and tourist are now finding it a land of delight where they may enjoy its wonderful climate and scenery amidst the comforts of modern life or where they may retire for a time into the solitude and freedom of a primitive existence.

The approach to this region is hardly an inspiring one. Vast, undulating, treeless, the Great Plains appear barren and desolate at first. One is apt to overlook the lesser features in contemplation of the wide expanse of land and sky. Due to lack of rainfall and to the drying winds which frequently sweep over the plains region the natural vegetation is mostly low and rather sparse

but is composed of a surprisingly large number of species. Shrubs and even trees are not wholly lacking on the plains. Every outcropping of rock is almost certain to harbor some of the former and all the streams that traverse the region are bordered with the latter, while some succulent shrubs of the cactus family occur almost everywhere.

Coming to the foothills, forerunners of the mountains, one meets new conditions and a great increase in woody vegetation. Here in sheltered nooks, along rocky ridges, and within gulches and canyons, occurs a wealth of shrubs and a considerable number of tree species. Every new level of ascent into the mountains brings new conditions and corresponding changes in the vegetation. The season of growth is shortened to correspond with a decrease in average temperature of about one degree F. for each 325 feet of elevation, while precipitation of moisture increases directly with the greater coolness.

Extensive forests of pine, spruce, and fir clothe the vast slopes of the mountains themselves and reach almost to the level of perpetual snow. Above timber line, which lies between 11,000 and 12,000 feet altitude, the vegetation again appears low and stunted, even the tree species which brave the inclement upper reaches of the timbered zone

being reduced to dwarfish, grotesquely distorted forms. This is the "Land of Tahosa," the land of mountain peaks. The plant life which at lower levels assumes the upright position here prostrates itself before the wild ungoverned elements of the atmosphere as if seeking the protection of earth while reaching ever upward toward the utmost limits of these lofty heights.

A journey of thirty miles in a direct line from the irrigated sections of the Great Plains to the top of the Continental Divide, at an elevation of 14,000 feet, presents about as great a variation of climatic conditions as in going 1,200 miles from south to north. This fact mainly accounts for the large number of plant species which are to be found in this region.

To facilitate the study of our shrubs and trees the region may be divided horizontally into five zones, which differ according to altitude, as follows:[1]

I. The Plains Zone, which joins the foothills, along the eastern base of the mountains, at an elevation between 5,000 and 6,000 feet above sea level.

II. The Foothills Zone which extends from the plains zone to about 8,000 feet elevation.

[1] From Ramaley's *Trees and Shrubs of Colorado.*

III. The Montane Zone which joins the upper limits of the foothills zone and reaches an elevation of about 10,000 feet.

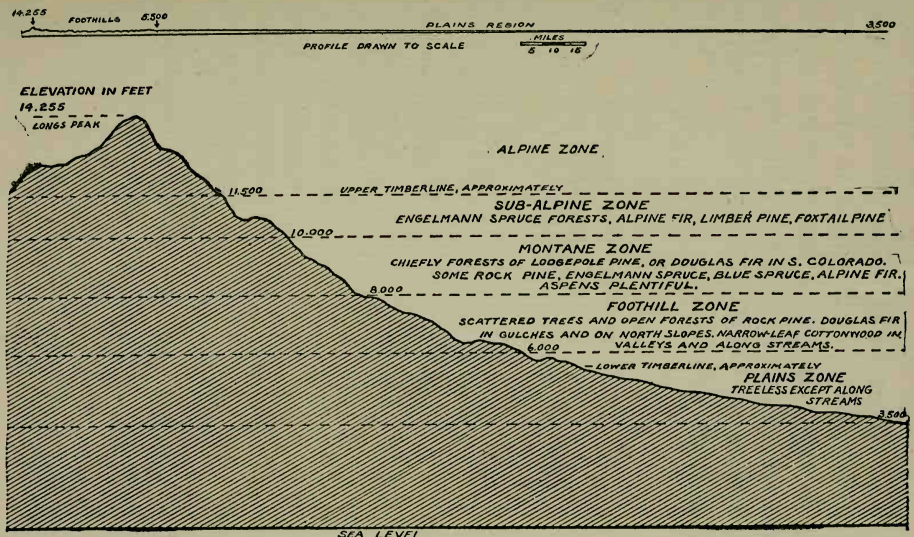
IV. The Sub-alpine Zone which extends from the montane zone to timber line at an average elevation of about 11,500 feet.

V. The Alpine Zone which comprises all areas above timber line.

Considerable variation in the limits of these zones may be noted between the northern and southern boundaries of this region. Thus from southern Wyoming into northern New Mexico, a total range of about 300 miles, timber line, which lies at about 11,300 feet elevation at the north in Wyoming, is nearly 400 feet higher at the south in New Mexico.

The uniformity of these zones is, moreover, much interfered with by the broken and uneven character of the mountains themselves. Deep canyons and innumerable gulches cut into the flanks of the mountain slopes while open areas, which vary from small pockets among the hills to large parks enclosed by the higher mountains, occur at frequent intervals.

These irregularities of topography are accompanied by corresponding irregularities in the factors which affect the distribution of



PROFILE OF COLORADO FROM TOP OF LONGS PEAK TO EASTERN BORDER OF STATE

FIG. 1. Diagram of altitude zones in Colorado

plant life, such as heat, moisture, wind, and soil. Consequently plants are frequently found at higher or at lower elevations than the average limits of the zones to which they may belong. For this reason exact statements regarding the limits of altitude within which plants of the region occur can be given only in a general way.

CONTENTS

	PAGE
PREFACE	v
INTRODUCTION	ix
GENERAL KEY	3
SHRUBS AND TREES WITH NAKED SEEDS	5
SHRUBS AND TREES WITH COVERED SEEDS	7
LEAF KEY TO THE GENERA OF SHRUBS AND TREES	13
PINE FAMILY	25
JOINT FIR FAMILY	59
LILY FAMILY	62
WILLOW FAMILY	67
BIRCH FAMILY	86
BEECH FAMILY	92
THE MISTLETOE FAMILY	97
THE ELM FAMILY	99
GOOSEFOOT FAMILY	101
BUTTERCUP FAMILY	107
THE BARBERRY FAMILY	109
GOOSEBERRY FAMILY	114
HYDRANGEA FAMILY	122
THE ROSE FAMILY	126
APPLE FAMILY	144
PLUM FAMILY	154
PEA FAMILY	159
BEAN CAPER OR CALTROP FAMILY	163
RUE FAMILY	165

CONTENTS

	PAGE
Sumach Family	168
Staff-Tree Family	172
Maple Family	173
Soapberry Family	177
Buckthorn Family	179
Grape Family	183
Cactus Family	186
Oleaster Family	193
Dogwood Family	197
Heath Family	199
Huckleberry Family	204
Olive Family	208
Night-Shade Family	212
Honeysuckle Family	214
Sunflower or Composite Family	224
Glossary of Terms Used	235
Index	239

COLOR PLATES

PLATE		FACING PAGE
I.	Colorado Blue Spruce . .	*Frontispiece*
II.	White or Concolor Firs, North Cheyenne Canyon	26
III.	A Forest of Mature Lodgepole Pine in the Montane Zone	44
IV.	Peach-Leaved Willow with Single Trunk	50
V.	A Canyon Road in the Foothills Zone in Autumn	78
VI.	A Small Mountain Park at 9000 Feet Elevation	92
VII.	Alpine Fir in the Sub-Alpine Zone .	148
VIII.	Engelmann Spruce Forest . . .	206
IX.	Wind Timber at Timber Line . . .	224

Trees and Shrubs
of the
Rocky Mountain Region

GENERAL KEY

Shrubs and trees differ from herbs in having woody stems above ground all or a part of which remains alive over winter.

The plants described in this work are here grouped into three size classes, as follows:

I. Trees and tall shrubs.
II. Shrubs and undershrubs.
III. Vines and trailers.

No sharp distinction can always be drawn between the plants of each class. Thus a plant that may grow to the size and form of a tree in the most favorable portion of its range and zone may be dwarfed to the size of a shrub in a dry, cold or exposed site, as at high altitudes or at the far north.

Trees and shrubs differ chiefly as follows: Trees grow with a single stem or trunk which may branch some distance above ground and usually reach a height above fifteen feet. Shrubs produce a cluster of stems which all arise from the same root system at or below the surface of the ground and reach a height

about equal to that of an average person. Shrubs are also called bushes. Tall shrubs are intermediate between shrubs and trees, and may be two or three times the height of a man, while the lowest bushes are called undershrubs and are less than the height of the average man. Woody vines are shrubs with stems too slender to stand erect. They may be divided into climbing, and trailing vines.

While the use of technical botanical terms has been avoided as far as possible it will be necessary for purposes of identification to become familiar with the principal parts of the leaf and the flower and to some extent with the fruit.

Botanical keys, while usually not all that could be desired, are still the most useful means yet devised for identifying plants. The keys here used are based upon the choice between two contrasted characters so that if a specimen does not fit the first it should belong under the second. By following the numbers step by step in this way one is led to the family or the genus to which the plant belongs. Reference to the page indicated will furnish a fuller description and in most cases a picture of the species. The straight line to one side of each illustration represents one inch in the scale of the drawing.

SHRUBS AND TREES WITH NAKED SEEDS

Class I (Gymnosperms)

The plants of this class have small or minute flowers which are borne singly or in small cone-like clusters consisting of scales and are without calyx and corolla. The stamens and pistils are produced in separate clusters, both kinds, in most cases, upon the same plant. When in bloom the scales of the pistillate cluster are spread apart and the ovules which they bear are thus exposed so that the pollen grains from the stamen flowers come in direct contact with them. Soon after blossoming the scales close tightly and cover the ovules which later become fertilized and ripened into seeds. In species with dry cones the scales open or fall apart when ripe and allow the seeds to drop out while in those with fleshy fruit the cone-scales become united and retain the seeds within a berry-like structure.

Two families of shrubs and trees of this class, all evergreens, occur in our region.

Key to the Families of Gymnosperms

Shrubs and trees with resinous sap and evergreen scale-shaped, awl-shaped or needle-shaped leaves, fruit a dry cone consisting of scales, or berry-like.

Pine Family (*Pinaceæ*) p. 25

Shrubs with jointed, rushlike green branches, and leaves represented only by thin bracts at the nodes. Fruit consisting of one to three naked, erect seeds surrounded by overlapping scales.

Joint Fir Family (*Gnetaceæ*) p. 59

SHRUBS AND TREES WITH COVERED SEEDS

Class II. (Angiosperms)

In this class of plants the ovules are enclosed from the first within the ovary of the pistil, which bears a stigma or receptive surface to receive the pollen grains. Here the pollen grains produce delicate tubes (pollen tubes) which penetrate the ovary and bring about the fertilization of the contained ovules. The fruit consists of the ripened ovary and the enclosed seeds and may be either dry, fleshy or pulpy when mature. The dry fruits may be nutlike or small and seedlike or they may be in the form of a pod which splits open at maturity to discharge the few or numerous seeds. The fleshy fruits are in the form of berries, drupes, or stone-fruits, or a pome, or apple-fruit.

The plants of this class are divided into two divisions as follows:

DIVISION I. PLANTS WITH ONE COTYLEDON

(Monocotyledons)

These are plants with one seed-leaf or cotyledon, in the seed; wood of the stem in fiber-like strands; leaves with mostly parallel veins; and flowers with parts in threes or multiples of three.

One family only, of this division, is represented in our region.

Lily Family (*Liliaceæ*) p. 62

DIVISION II. PLANTS WITH TWO COTYLEDONS

(Dicotyledons)

The shrubs and trees in this division have two cotyledons, or seed-leaves; stems with wood in concentric annual layers around a central pith; leaves with veins in the form of a network; and flowers with parts in fours or fives.

In some plants the stamens are numerous while the calyx, corolla and pistils are variously modified by the union of their parts or, in some cases, with each other.

Flower and Fruit Key to the Families of Dicotyledons

1. Flowers imperfect, one or both kinds in catkins. 2.

1. Flowers mostly perfect, not in catkins. 4.
2. Staminate and pistillate flowers both in catkins. 3.
2. Staminate flowers in catkins; pistillate solitary or few; fruit a nut (an acorn in ours). *Beech Family* p. 92
3. Staminate and pistillate catkins on different plants; seeds with cotton. *Willow Family* p. 67
3. Staminate and pistillate catkins on the same plant; fruit a nut or seedlike, without cotton. *Birch Family* p. 86
4. Small leafless parasites with jointed stems growing upon evergreen trees. *Mistletoe Family* p. 97
4. Shrubs and trees with green leaves; non-parasitic. 5.
5. Flowers minute, crowded into heads surrounded by a calyx-like involucre of scales, the whole appearing as one flower. *Sunflower Family* p. 224
5. Flowers small to large, variously clustered but not in heads with calyx-like involucre. 6.
6. Fruit dry, seedlike, winged. 7.
6. Fruit dry or fleshy, not winged. 10.
7. Leaves simple. 8.
7. Leaves compound. 9.
8. Leaves alternate, often scurfy. *Goosefoot Family* p. 101

8. Leaves opposite, never scurfy.
Maple Family p. 173
9. Leaves alternate. *Rue Family* p. 165
9. Leaves opposite. *Olive Family* p. 208
10. Fruit dry. 11.
10. Fruit more or less fleshy or juicy when ripe. 19.
11. Fruit seedlike; usually with long feathery style. 12.
11. Fruit of one or more pods, without feathery styles. 13.
12. Half-woody climbing vine.
Buttercup Family p. 107
12. Shrubs, not climbing.
Rose Family p. 126
13. Leaves simple. 14.
13. Leaves compound. 18.
14. Leaves alternate. 15.
14. Leaves opposite. 17.
15. Flowers with united petals.
Heath Family p. 199
15. Flowers with separate petals. 16.
16. Fruit 3-lobed, splitting into 3 nutlets.
Buckthorn Family p. 179
16. Fruit of small separate pods.
Rose Family p. 126
17. Low trailing evergreen shrub.
Staff Tree Family p. 172
17. Upright deciduous-leaved shrubs.
Hydrangea Family p. 122

18. Flowers pink or purple.
Pea Family p. 159
18. Flowers yellow.
Bean Caper Family p. 163
19. Succulent plants with leafless, green spiny stems. *Cactus Family* p. 186
19. Woody-stemmed shrubs and trees. 20.
20. Fruit a pome (apple-like).
Apple Family p. 144
20. Fruit a drupe (stone fruit), or drupe-like. 21.
20. Fruit a berry, or berry-like. 27.
21. Leaves alternate. 22.
21. Leaves opposite. 24.
22. Leaves simple. 23.
22. Leaves compound.
Sumach Family p. 168
23. Pith of twigs of minute transverse plates; bark of trunk rough with warty projections or ridges. *Elm Family* p. 99
23. Pith of twigs solid: bark of trunk smooth or scaly or ridged.
Plum Family p. 154
24. Twigs and leaves silvery-scaly.
Oleaster Family p. 193
24. Twigs and leaves not silvery-scaly. 25.
25. Leaves palmately-veined.
Honeysuckle Family p. 204
25. Leaves pinnately-veined. 26.

26. Leaves large, entire-margined.
Dogwood Family p. 197
26. Leaves small, finely toothed.
Olive Family p. 208
27. Fruit thimble-shaped, of many united parts. *Rose Family* p. 126
27. Fruit not thimble-shaped, simple. 28.
28. Leaves alternate. 29.
28. Leaves opposite.
Honeysuckle Family p. 214
29. Climbing vines. *Grape Family* p. 183
29. Shrubs not climbing. 30.
30. Leaves prickly-margined.
Barberry Family p. 109
30. Leaves not prickly-margined. 31.
31. Leaves evergreen. *Heath Family* p. 199
31. Leaves not evergreen. 32.
32. Leaves compound.
Soapberry Family p. 177
32. Leaves simple. 33.
33. Calyx beneath the ovary.
Nightshade Family p. 212
33. Calyx upon the ovary. 34.
34. Leaves pinnate, not lobed.
Huckleberry Family p. 204
34. Leaves palmate, more or less lobed.
Gooseberry Family p. 114

LEAF KEY TO THE GENERA OF SHRUBS AND TREES

1. Evergreens with needle-shaped, awl-shaped or scale-shaped leaves. 2.
1. Leaves deciduous, sometimes persistent or evergreen but not needle-shaped, awl-shaped or scale-shaped. 7.
2. Leaves needle-shaped, ¾–6 inches long. 3.
2. Leaves awl-shaped or scale-shaped, 1/16–½ inch long. 6.
3. Needles in bundles of 2–5, with sheath at base. *The Pines* p. 26
3. Needles single, without sheath at base. 4
4. Needles stiff, sharp-pointed, borne on a persistent stalklike base which roughens the twigs after the needles fall. *The Spruces* p. 38
4. Needles rather soft and blunt, without stalk-like base, naked twigs smooth and with leaf scars. 5.
5. Leaves narrowed at the base; buds pointed, brown. *Douglas Fir* p. 42
5. Leaves not much narrowed at base; buds blunt, greenish. *Balsam Firs* p. 45

6. Leaves green; stems not jointed and rush-
Junipers and Cedars p. 51
6. Leaves reduced to sheathing, colorless bracts; stems jointed and rushlike.
Joint Firs p. 59
7. Leaves bayonet-like, with veins in form of parallel fibers.
Yucca, Spanish Bayonet p. 62
7. Leaves not bayonet-like, veins usually forming a network. (Leaves greatly reduced or wanting in mistletoes and cacti.) 8.
8. Leaves reduced to minute scales or wanting. 9.
8. Leaves more or less well developed, green or greenish. 10.
9. Small, freely-branched parasites with jointed, yellowish stems growing upon the branches of evergreen trees.
Mistletoes p. 97
9. Succulent, green-stemmed, mostly leafless plants armed with spines.
Cacti p. 186
10. Leaves alternate (sometimes crowded into clusters). 11.
10. Leaves opposite. 69.
11. Leaves simple. 12.
11. Leaves compound. 58.
12. Leaves or their divisions very narrow, or linear; usually without a distinct

stalk or petiole; shrubs or undershrubs. 13.

12. Leaves with a well developed blade and usually a distinct petiole; low shrubs to tall trees. 22.

13. Leaves with pronounced odor when bruised. 14.

13. Leaves with no pronounced odor when bruised. 15.

14. Odor sagelike. *Sage brush* p. 230

14. Odor strong but not sage-like. *Thamnosma* p. 166

15. Leaves evergreen. *Phyllodoce* p. 200

15. Leaves not evergreen. 16.

16. Stems more or less spiny. 17.

16. Stems not spiny. 19.

17. Leaves fleshy, often scurfy. 18.

17. Leaves reduced to stiff spines. *Tetradymia* p. 228

18. Leaves flattened. *Grayia* p. 103

18. Leaves 3-angled. *Greasewood* p. 105

19. Flowers not in composite heads. *Eurotia* p. 105

19. Flowers in composite heads, within an involucre. 20.

20. Scales of the involucre 4–6. *Tetradymia* p. 228

20. Scales of the involucre more than 6. 21.

21. Stems striate or finely ribbed. *Baccharis* p. 227

21. Stems smooth. *Rabbit Brush* p. 226
22. Trees of medium to large size, 25 feet or over. 23.
22. Tall shrubs or small trees under 25 feet tall. 25.
22. Undershrubs up to 6 feet tall. 31.
22. Prostrate or creeping shrubby plants. 56.
23. Buds covered with one scale. *Willow* p. 78
23. Buds with several overlapping scales. 24.
24. Leaf blades toothed or serrate, never lobed. *Aspen, Cottonwood* p. 68
24. Leaf blades more or less deeply lobed. *Oak, scrub oak* p. 92
25. Branches with thorns (thornless in cherries). 26.
25. Branches without thorns. 27.
26. Fruit a drupe with one stone. *Plum and Cherry* p. 154
26. Fruit a pome with several bony seeds. *Hawthorns* p. 148
27. Buds covered with 1 or 2 scales; scales not over-lapping. 28
27. Buds covered with several overlapping scales. 29.
28. Leaves mostly narrow, entire or finely toothed; bark intensely bitter. *Willows* p. 78

28. Leaves broad, coarsely toothed; bark not intensely bitter. *Alder* p. 88
29. Bark of trunk rough. *Hackberry* p. 99
29. Bark of trunk smooth. 30.
30. Bark reddish-brown, marked with large horizontal lenticels, or chalky white and separating into papery layers. *Birch* p. 86
30. Bark light gray, without large horizontal lenticels. *Shad* p. 145
31. Leaf blade usually more than 1½ times as long as broad. 32.
31. Leaf blade less than 1½ times as long as broad. 51.
32. Leaf blade more or less deeply lobed (3-toothed at apex in 34). 33.
32. Leaf blade entire, serrate or toothed, not lobed. 37.
33. Leaves large; fruit an acorn. *Scrub Oak* p. 92
33. Leaves not large; fruit not an acorn. 34
34. Leaves with sagelike odor when bruised. *Sage, Sagebrush* p. 230
34. Leaves without sagelike odor. 35.
35. Leaves all 3-lobed at apex; fruit without feathery tail. *Antelope Brush* p. 132
35. Leaves 3–7 lobed; fruit feathery tailed. 36.
36. Leaves with small glandular dots; fruits usually 5 in a cluster. *Cliff Rose* p. 127, 129

36. Leaves without glandular dots; fruits numerous. *Fallugia* p. 130
37. Leaf blade with 3 prominent ribs or veins arising from the base. *Ceanothus* p. 180
37. Leaf blades without 3 prominent ribs at the base. 38.
38. Leaf margins prickly; stems armed with branched prickles. *Barberry* p. 110
38. Leaf margins and stems without prickles. 39.
39. Leaves large; fruit a nut within a leafy husk. *Hazelnut* p. 86
39. Leaves moderately large to small; fruit not a nut. 40.
40. Buds with a single scale; twigs intensely bitter. *Willows* p. 78
40. Buds with several scales; twigs not intensely bitter. 41.
41. Leaves and twigs mealy or scurfy; branches often spine-tipped. *Saltbush* p. 101
41. Leaves and twigs not mealy or scurfy (sometimes silvery-scaly or rusty); branches spineless. 42.
42. Leaves or twigs, or both, covered with brownish or silvery scales or scalelike hairs. 43.
42. Leaves and twigs without silvery or rusty scales. 44.

43. Leaves and twigs with silvery scales; fruit a silvery drupe.
Silver berry p. 193
43. Leaves with rusty scales and bristly hairs; fruit a capsule.
Menziesia p. 202
44. Leaves rather coarsely toothed or serrate. 45.
44. Leaves entire or finely serrate. 47.
45. Leaves persistent; fruit feathery-tailed.
Mountain Mahogany p. 127
45. Leaves deciduous; fruit not feathery-tailed. 46.
46. Fruit berry-like.
Shad, Service berry p. 145
46. Fruit not berry-like.
False Spiræa p. 132
47. Flowers minute, in composite heads surrounded by an involucre.
Baccharis p. 227
47. Flowers not minute nor in composite heads. 48.
48. Fruit a berry. 49.
48. Fruit a drupe or pome. 50.
49. Mostly low, shrubby plants of moist woods and mountain slopes in the subalpine zone. *Huckleberry* p. 204
49. Somewhat spiny shrub growing on dry rocky hillsides in the foothills zone.
Matrimony Vine p. 212

50. Fruit a drupe *Cherry* p. 154
50. Fruit a pome. *Peraphyllum* p. 144
51. A tall-climbing vine with tendrils. *Wild Grape* p. 183
51. Spreading or erect shrubs without tendrils. 52.
52. Leaves finely serrate; shrub of boggy ground. *Bog Birch* p. 90
52. Leaves toothed or lobed; not growing in bogs. 53.
53. Stems prickly. *Gooseberry* p. 114
53. Stems without prickles. 54.
54. Flowers with tubular or bell-shaped corolla. *Wild Currant* p. 120
54. Flowers with separate petals. 55.
55. Flowers large, solitary or few in a cluster. *False Raspberry* p. 132
55. Flowers not large, in dense clusters. *Ninebark* p. 135
56. Leaves deciduous; creeping shrub of subalpine and alpine regions. *Creeping Willow* p. 84
56. Leaves evergreen. 57.
57. Leaves about 1 inch long; 3 times as long as broad. *Kinnikinick* p. 203
57. Leaves about ½ inch long, rounded. *Wintergreen* p. 203
58. Leaflets with prickly teeth; evergreen. *Barberry* p. 109

58. Leaflets without prickly teeth; not evergreen. 59.
59. Tall climbing vine with tendrils; leaflets. 5. *Woodbine* p. 184
59. Shrubs with spreading or erect stems. 60.
60. Leaflets with entire margin. 61.
60. Leaflets with serrate, toothed or lobed margin. 64.
61. Leaflets 5–7, crowded near the end of the petiole. *Shrubby cinquefoil* p. 138, 140
61. Leaflets numerous. 62.
62. Stipules in the form of stout prickles. *Locust* p. 159
62. Stipules not prickle-like. 63.
63. Leaflets blunt; fruit a small pod. *False Indigo* p. 160
63. Leaflets taper-pointed; fruit berry-like. *Soap Berry* p. 177
64. Stems more or less prickly. 65.
64. Stems without prickles. 66.
65. Leaflets 3–5, large. *Raspberry* p. 140
65. Leaflets 5 or more, small. *Rose* p. 140
66. Leaflets 3. 67.
66. Leaflets 9 or more. 68.
67. Tall shrub or small tree; fruit dry, winged. *Hoptree Wafer Ash* p. 166
67. Shrub low or medium tall; fruit drupe-like. *Sumach* p. 168

68. Juice resinous or milky; leaves without stipules. *Sumach* p. 168
68. Juice not milky nor resinous; leaves with deciduous stipules. *Mountain Ash* p. 152
69. Leaves simple. 70.
69. Leaves compound. 85.
70. Branches thorny or spiny. 71.
70. Branches not thorny or spiny. 72.
71. Desert shrub with showy yellow flowers. *Coleogyne* p. 130
71. Stout shrub or small tree along streams; flowers not showy. *Buffalo Berry* p. 165
72. Leaves palmately ribbed. 73.
72. Leaves pinnately ribbed. 74.
73. Fruit winged, double. *Maple* p. 173
73. Fruit a drupe *Viburnum* p. 214
74. Leaves evergreen. 75.
74. Leaves not evergreen. 76.
75. Low shrub; leaves very narrow, entire. *Pale Laurel* p. 200
75. Spreading or trailing; leaves somewhat broad, finely serrate. *Pachystima* p. 172
76. Leaf blades with serrate or toothed margin. 77.
76. Leaf blades with entire or wavy margin. 80.

77. Leaves coarsely serrate; flowers showy. *Jamesia* p. 122
77. Leaves finely serrate; flowers not showy. 78.
78. Fruit dry, winged. *Ash* p. 208
78. Fruit a drupe or berry. 79.
79. Leaf blades much narrowed toward the base. *Forestiera* p. 211
79. Leaf blades somewhat rounded at the base. *Buckthorn* p. 179
80. Twigs and leaves with brownish, scurfy scales. *Buffalo Berry* p. 193
80. Twigs and leaves without scurfy scales. 81.
81. Stems and branches bright red or reddish brown. *Dogwood* p. 197
81. Stems and branches not bright red. 82.
82. Petals large, separate; fruit dry. 83.
82. Petals small, united, at least at the base; fruit a berry. 84.
83. Leaves, 3–6 times as long as broad. *Fendlera* p. 125
83. Leaves less than 3 times as long as broad. *Mock Orange* p. 122
84. Flowers white or pink. *Buckbrush* p. 216
84. Flowers yellow or yellowish. *Honeysuckle* p. 218
85. Clambering or climbing vine with partly woody stem. *Clematis* p. 107

85. Shrubs or trees with woody stems. 86.
86. Leaves evergreen; leaflets 2, small, twigs and leaves sticky; odor strong, like creosote. *Creosote Bush* p. 163
86. Leaves deciduous; leaflets large. 3 or more, not sticky nor with creosote-like odor. 87.
87. Pith of new shoots large; fruit a berry. *Elder* p. 222
87. Pith of new shoots not very large; fruit dry, winged. 88.
88. Fruit single. *Ash* p. 208
88. Fruit double. *Maple* p. 173

PINE FAMILY (*Pinaceæ*)

Our species of this family are all evergreen trees or shrubs with needle-shaped, awl-shaped, or scale-shaped leaves and resinous sap. The inconspicuous flowers are borne in small conelike clusters on the previous year's growth, staminate and pistillate flowers being in separate cones on the same tree. The

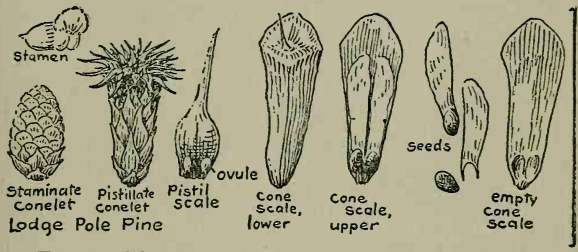


FIG. 2. Flower structure of a pine, a Gymnosperm

pistillate cones consist of crowded scales, each scale bearing two naked ovules upon its upper surface. In most of the species the cones become dry and woody and the seeds fall out as the scales spread apart when ripe. In others the pistillate cone scales become fleshy and grown together in the form of a more or less juicy berry containing the few seeds.

Key to the Genera

a. Leaves needle-shaped; fruit a dry scaly cone. b.

b. Needles in clusters of 2–5. Enclosed at base with a short, scaly sheath; cone scales thick and woody.
1. *Pinus*—Pines

b. Needles single; cone scales thin. c.

c. Needles stiff, 4-angled; naked branchlets rough with the persistent leaf bases; cones hanging; cone scales persistent.
2. *Picea*—Spruces

c. Needles flattened; naked branchlets covered with rounded leaf scars, and quite smooth. d.

d. Needles much narrowed at base, scars small, cones hanging, feathered with 3-pronged bracts.
3. *Pseudotsuga*—Douglas Fir

d. Needles not much narrowed at base, scars quite large, circular, cones erect, the scales falling apart when ripe.
4. *Abies*—Fir

a. Leaves awl- or scale-shaped; fruit berry-like. 5. *Juniperus*—Junipers

1. THE PINES (*Pinus*)

Our pines are all trees and are distinguished from the other genera of the pine family by

II. WHITE OR CONCOLOR FIRS
NORTH CHEYENNE CANYON
Near Colorado Springs, Colorado

having the needle-shaped foliage leaves in little clusters of two to five, each cluster surrounded at base by a sheath of thin scales. Fruit a cone composed of woody scales which are thickened at the tips and armed, in some species, by curved prickles. The cones ripen at the end of the second autumn after flowering. Our most important lumber trees occur in this genus.

Key

a. Needles 5 in a cluster. b.
b. Cone scales tipped with slender prickles. 1. *Bristle-cone Pine*
b. Cone scales without prickles. 2. *Limber Pine*
a. Needles 2 to 3 in a cluster. c.
c. Needles 3 to 6 inches long, 2 and 3 in a bundle on the same tree. 3. *Yellow Pine*
c. Needles mostly less than 3 inches long. d.
d. Needles 2 in a cluster, 1½ to 2½ inches long. 4. *Lodgepole Pine*
d. Needles 2 or 3 in a cluster, 1 to 1½ inches long. 5. *Pinyon Pine*

Bristle-cone Pine, Foxtail Pine

(*Pinus aristata* Engelm.)

The bristle-cone pine is a tree of the high altitudes in the mountains of central and

southern Colorado, of Utah, Nevada and in southern Arizona and California. In Colorado, it is nowhere abundant but occurs singly, in small groups or in open groves of rather limited extent. Its most accessible locations in the eastern part of its range probably are on the lower slopes of Pike's Peak west of Colorado Springs, above Manitou and along the divide toward Florisant in Colorado.

It is a small or medium sized tree of bushy habit which seldom reaches a height of 50 feet. The bark of young trees is thin and light silvery gray while on the old trunks it is divided into scaly ridges of a dark brownish gray color. The trunk is usually short, low-branched and often forked and the rather soft wood is apt to be twisted and knotty. It somewhat resembles the limber pine in manner of growth but is easily recognized by its shorter needles, which are 1 to 1½ inches long and which cling to the branches for 12 to 14 years and thus give the twigs the appearance of elongated brushes. The cones are 2 or 3 inches long with bristle-tipped scales and winged seeds. Its wood is rarely used except occasionally for fuel and for mine timbers. The tree can be grown on the plains as an ornamental evergreen and appears to succeed as far as tried.

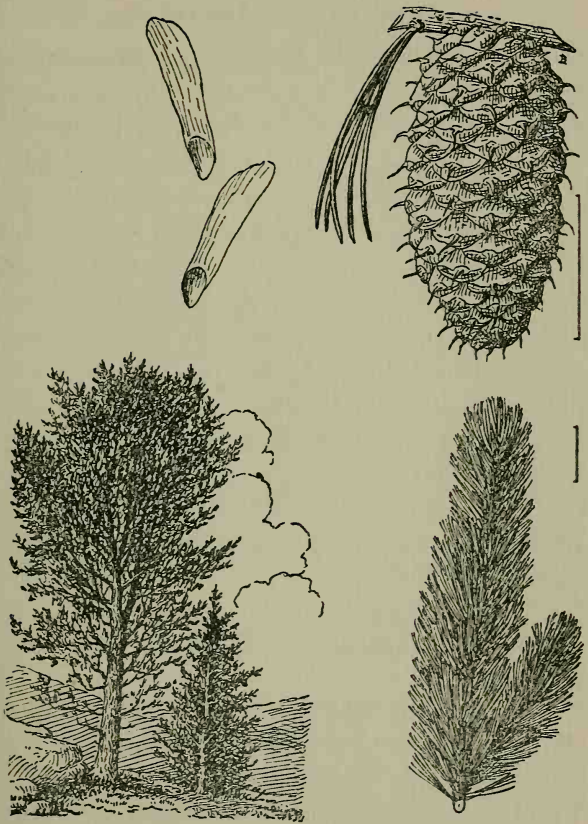


FIG. 3. Bristle-cone pine (*Pinus aristata*). A leafy branch; a cone and needles; seeds

The Limber Pine

(*Pinus flexilis* James)

This tree occurs almost throughout the Rocky Mountain region and into eastern California. It is a tree of the exposed, wind-swept slopes and rocky ridges at high elevations where it sometimes forms small open groves or scraggly forests, mixed with lodgepole pine and Douglas fir. At timber line it sometimes forms densely matted or distorted, prostrate growths of grotesque shapes. In sheltered canyons the limber pine occasionally forms a moderately tall tree with massive trunk covered with gray, furrowed bark an inch or two thick. A sparse growth of this tree, in company with Rocky Mountain yellow pine and red cedar, occurs in Weld County near the Pawnee buttes in Colorado and several patches of it extend into southeastern Wyoming as far as Nebraska.

As a rule the tree is heavily branched low down and has a few long, flexible lateral branches from which its name is derived. The bark of young trees is smooth, silvery gray in color and quite thin. The rather slender bluish-green needles are 1½ to 3 inches long, are borne in tufts of five, or occasionally four, and are enclosed at first by a

sheath of long, thin scales which soon fall off and leave the needles naked at the base.

The cones are the largest of any of our pines, being sometimes 6 inches long. The scales are broad, without prickles and bear one or two wingless seeds about ⅓ of an inch

FIG. 4. Limber pine (*Pinus flexilis*). A bundle of needles; a cone; seeds

long. On account of the seeds this pine has sometimes been mistaken for the pinyon pine.

The wood of the limber pine is moderately soft but is usually cross-grained and knotty. It is seldom used for lumber but is employed to some extent for mine timbers and ties. The tree is adapted to planting on the plains as its moisture requirements are not great.

Rocky Mountain Yellow Pine, Rock Pine

(*Pinus ponderosa* var. *scopulorum* Engelm.)

This is the Rocky Mountain form of *Pinus ponderosa*, commonly known as western yellow pine and bull pine, a tree which extends from the Rocky Mountains to the Pacific Coast and from southern British Columbia to western Texas and northern Mexico. In Colorado the rock pine occurs all along the eastern slopes of the mountains and over much of the western portions of the state reaching its best development as a lumber tree in the southwest. A few trees occur in northeastern Weld County in Colorado in the vicinity of the Pawnee buttes. Outside of our state its easternmost range is in central Nebraska.

This is the common pine tree of the foothills and warmer slopes of the mountains up to 8,500 feet elevation and occasionally as scattered individuals or small groups up to 9,000 feet.

It varies from a small stunted tree a few feet high, on dry rocky ridges, to a majestic tree 80 to 100 feet tall and 3 to 4 feet through in moist glades and on fertile well-watered slopes. The bark on younger trees is broken into rounded ridges covered with blackish scales, which form of the tree is known by

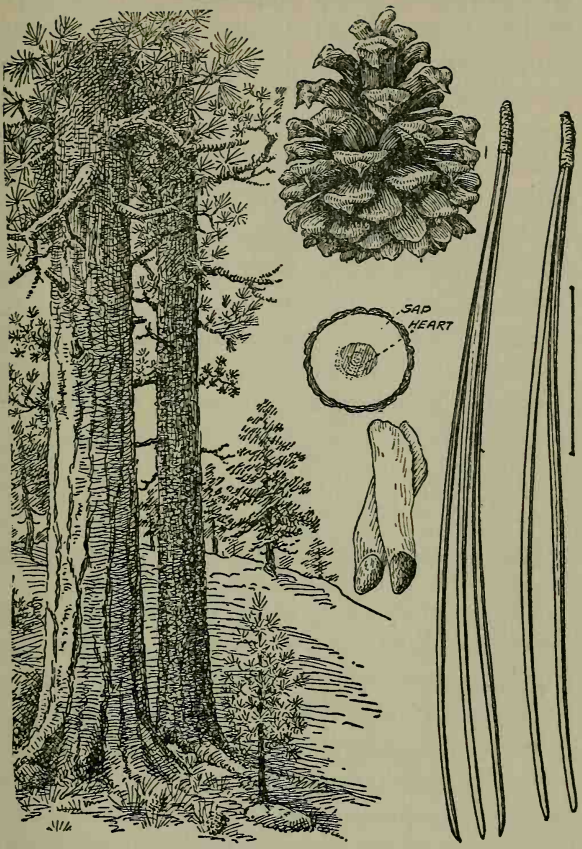


FIG. 5. Western yellow pine (*Pinus ponderosa*, var. *scopulorum*). Black jack and yellow pine types of trunks; needles 2 and 3 in a bundle; a cone; seeds; section of trunk.

lumbermen as black jack pine. In the oldest and largest trees the bark takes on a cinnamon red color and divides into long plates up and down the trunk and is from 1 to 3 inches thick.

The needles are 3 to 6 inches long and are borne in clusters of 2 and 3 on the same tree.

The cones are 2½ to 3 inches long, with prickle-tipped scales which open before the cones fall from the tree.

The rock or yellow pine is one of our chief lumber trees in Colorado and has been extensively lumbered in the southwest where new forests are now being reproduced naturally.

Lodgepole Pine

(*Pinus contorta* var. *Murrayana* Engelm.)

The lodgepole pine is the Rocky Mountain form of *Pinus contorta* which is scattered from the continental divide to the Pacific slope and from the Yukon to northern New Mexico, Arizona and California. In Colorado the lodgepole pine forms dense forests on slopes between 8,000 and 9,000 feet with extensions of at least 500 feet above and below these elevations.

In dense stands the trunks grow tall and slender and were used by the Indians for building tepees, hence its name, lodgepole

pine. Its trunk diameter is commonly less than one foot, except in old trees, and the bark is rarely over ¼ inch in thickness and

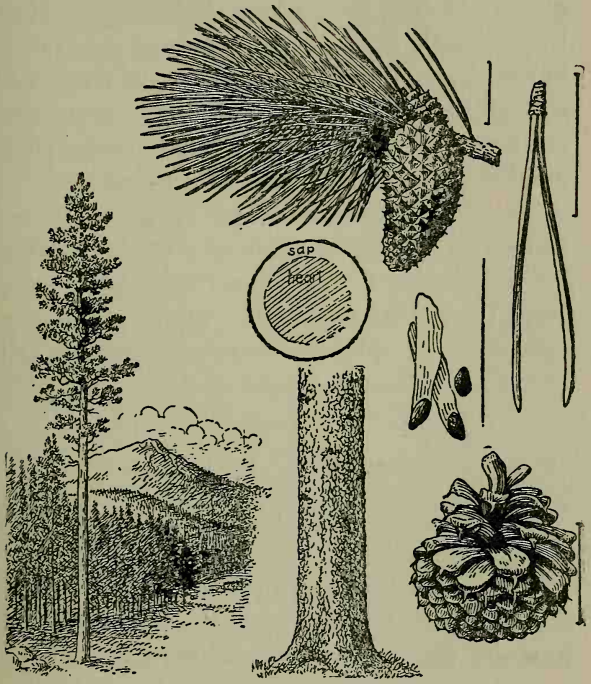


FIG. 6. Lodgepole pine (*Pinus contorta*, var. *Murrayana*). Trunk and section of same; a bundle of needles; cones, open and closed; seeds.

is covered with small rounded scales. Due to its light colored, rather soft wood it is often erroneously called white pine by lumbermen.

The needles, two in a bundle, are 2 to 3 inches long and of a more yellowish green than those of the yellow pine. The cones, about 1½ to 2 inches long, have small scales tipped with delicate prickles and are often borne in great profusion. Many of the cones remain closed and attached to the branches for many years and retain their seeds alive until released by the heat of a forest fire.

The lodgepole pine now furnishes more timber in Colorado than any other species, its chief uses being for railway ties, mine timbers, poles, posts and fuel. It is also used for saw timber whenever large enough to make lumber and boxboards.

Pinyon Pine, Nut Pine

(*Pinus edulis* Engelm.)

The pinyon occurs in scattered groves and open forests often mixed with cedars and junipers chiefly in the foothills zone of the mountains of southwestern Wyoming, Colorado, western Texas and Arizona. In Colorado its northernmost range is an isolated grove less than a square mile in area located about twenty-two miles north of Fort Collins near the road to Laramie, Wyoming. Here the largest trees on record are to be

found. It also occurs on the dry hillsides above Colorado Springs and about Manitou and from there southward. In the western part of Colorado it often covers extensive areas and is the principal tree on the Mesa Verde.

It is usually a low-spreading open-crowned tree with short branchy trunk. The wood is

FIG. 7. Pinyon pine (*Pinus edulis*). A bundle of needles; cones, open and closed; a seed

dense, and hard but too knotty for lumber. The needles are usually 2 to 3 in a bundle and about 1 inch long. The cones are nearly globular, about the length of the needles and the large scales are without prickles. The seeds are wingless and are the largest of any of our pines, being about ½ inch long.

The wood of the pinyon is used for fuel, charcoal and occasionally for fence posts, while the seeds, which were at one time extensively used for food by the Indians, are sold by confectioners as a delicacy.

2. THE SPRUCES (*Picea*)

Slender, conical-crowned trees with single, four-sided needles. The needles are joined to the branchlets by small, stalklike bases which remain after the upper portion of each needle drops, thus making the naked branchlets very rough. (Fig. 8.)

Key

Needles very stiff and sharp pointed; surface of twig among the needles naked; cones 2 to 4 inches long. 1. *Blue Spruce*

Needles moderately stiff and sharp pointed; surface of twig among the needles finely pubescent; cones 1 to 2 inches long. 2. *Engelmann Spruce*

Blue Spruce, Silver Spruce, Colorado Spruce

(*Picea pungens* Engelm.)

This, the state tree of Colorado where it is most abundant, occurs also to a limited

extent in southern Wyoming, in Utah and in northern New Mexico. It commonly occurs along streams and at the foot of moist

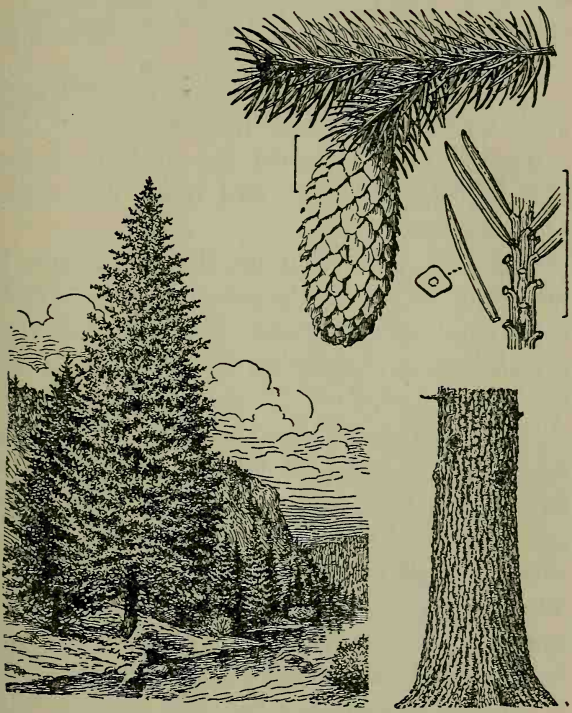


FIG. 8. The Colorado blue spruce (*Picea pungens*). Trunk of adult tree; needles; cone

slopes, mostly between 7,000 and 9,000 feet elevation, in groups and small groves. Until middle age the blue spruce is one of our love-

liest evergreen trees with its more or less regular whorls of foliage-covered branches and its often perfect conical form. In older age the crown usually becomes quite ragged and the lower branches die and drop off.

The bark on young trees is smooth and gray becoming broken into scales on the surface. On old trunks the bark becomes strongly ridged, thick and hard, and dark gray in color.

The stiff, spreading needles are about 1 inch long, very sharply pointed, and vary in color from a bright green to a clear, silvery bluish tone especially on the new growth of the season.

The cones vary in length from 2 to 4 inches and are composed of numerous thin, narrowed, light colored scales. The wood is light, soft and rather weak and is only occasionally used for lumber or other purposes. The chief use made of this tree is for ornamental planting for which purpose it is hardly excelled by any other evergreen. It is capable of enduring the heat and dry air of the plains or the cold and moisture of the northeastern states. It has been extensively planted both in this country and in Europe and some especially fine varieties are known.

Engelmann Spruce

(*Picea Engelmannii* (Parry) Engelm.)

This tree has a general range from the mountains of British Columbia southward along the interior mountains of the continent into northern New Mexico and Arizona.

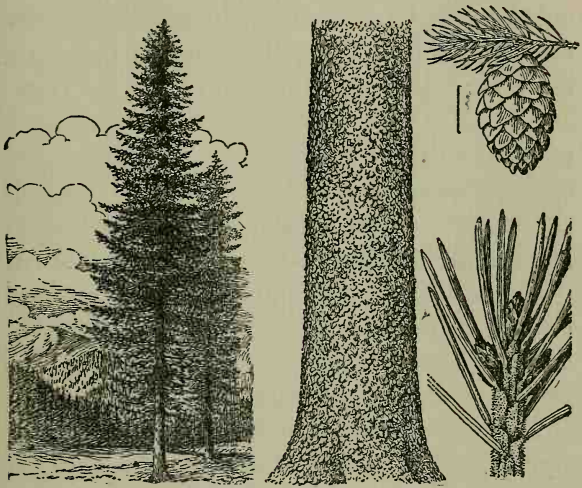


Fig 9. Engelmann spruce (*Picea Engelmannii*). Trunk of adult tree; needles and twig enlarged; cone

In Colorado it forms some of our most extensive and densest forests on the cool mountain slopes above 9,000 feet elevation. Under the best conditions for growth the Engelmann spruce becomes a magnificent tree

more than 100 feet tall and with a trunk diameter of 3 to 5 feet. At timberline it is sometimes dwarfed to a prostrate, spreading growth scarcely as tall as an average person.

In general appearance this tree resembles the blue spruce but becomes much larger. The cones are from 1 to 2 inches long and the scales are fairly stiff and brownish in color. The bark even on old trunks is rarely over ¼ inch thick and separates into thin rounded scales of a purplish cinnamon color. Its needles are not so stiff and sharply pointed as those of the blue spruce but they often possess the silvery color of those of the latter species. The surface of the twigs among the needles is typically pubescent or covered with minute hairs which are entirely absent in the blue spruce. In some of the trees at high altitudes the pubescence of the twigs is sometimes almost wholly lacking.

This is one of our most important lumber trees and, while the wood is light and not very strong, it is much used for saw timber, mine props, poles, posts and fuel. This spruce makes a good ornamental evergreen for situations that are not too hot and dry.

3. DOUGLAS FIR (*Pseudotsuga*)

Trees resembling both the spruces and the firs, but differing from the former, in this

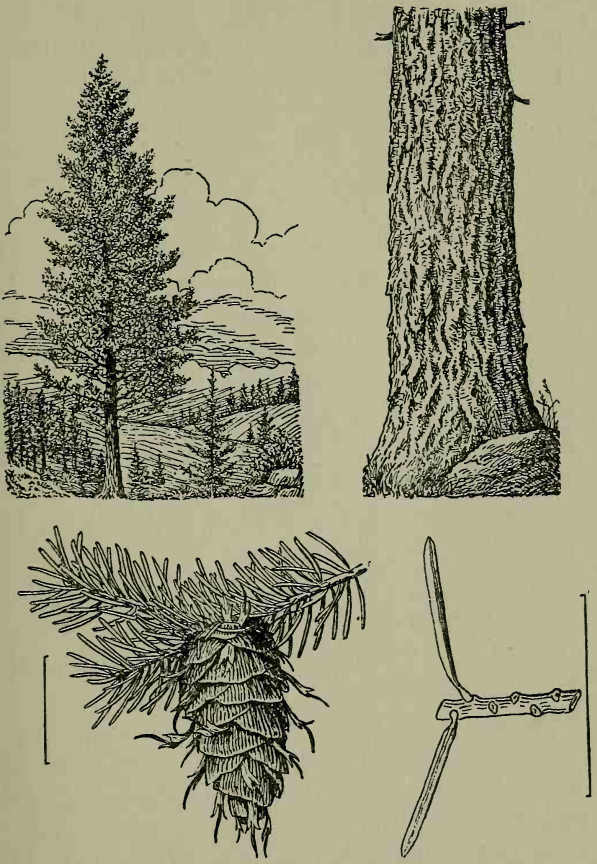


FIG. 10. Douglas fir (*Pseudotsuga taxifolia*). Trunk of adult tree; twig with needles; cone

region, by their flat, blunt tipped leaves, and from the latter by their cones, which are pendulous and feathered with projecting, sharp-pronged bracts. (Fig. 10.)

Douglas Fir, Douglas Spruce, Red Fir

(Pseudotsuga taxifolia)

This is a common tree in the forest regions of the northwest and southward from British Columbia and Alberta through the mountains to Texas and Mexico. It reaches its greatest size in the Pacific northwest on the foothills of the Cascades near the coast where it reaches a height of 250 feet and a diameter of over 12 feet. It is at present the greatest single source of our lumber supply and is known commercially as "fir."

The Rocky Mountain form of this tree, which occurs in Colorado, is a tree of slow growth and moderate size, seldom over 100 feet tall and 3 feet in diameter. It extends from the lower foothills nearly to timberline and often forms the principal tree growth on north and east exposures in the upper foothills zone.

It is a conical-crowned tree of more open, ragged shape than that of the spruces and true firs; the bark of young trees is smooth, gray and with small resin blisters but on

III. A FOREST OF MATURE LODGEPOLE PINE IN THE MONTANE ZONE

old trees becomes deeply furrowed, 2 to 3 inches thick and light grayish tan colored.

The needles are ¾ to 1¼ inches long and are similar to those of the true firs but are usually somewhat smaller and narrowed at the base. The small needle scars are somewhat raised and oval in shape. The cones are 2 to 3 inches long, with broad, thin scales and projecting, 3-pronged bracts, which character offers one of the best means of identifying this tree.

The wood is variable from coarse grained, hard and strong to fine grained and moderately soft. It is very durable and is one of our most valuable sources of timber for ties, mine timbers, posts and poles. This tree is the one chiefly cut for Christmas trees and is commonly called spruce and red spruce. Although not as beautiful as the true spruces, it is very hardy and is suited to ornamental planting where an evergreen tree is desired.

4. THE BALSAM FIRS (*Abies*)

Conical crowned trees of the higher altitudes. The needles are flattened, blunt or slightly notched at the tip, on lower branches, upward-curved and acute at the tip on cone-bearing branchlets. The cones grow erect on the topmost branches and the scales fall

apart when mature, leaving the spikelike axis on the tree. The bark has numerous balsam blisters filled with liquid pitch which oozes out when they are punctured.

Key

Leaves of vigorous lower branches 1 to 1½ inches long; resin tubes, seen in cross section with lens, midway between the two surfaces; cones purple or nearly black.
1. *Alpine Fir*

Leaves of vigorous lower branches 1½ to 2½ inches long; resin tubes close to lower surface; cones green, yellowish or purplish.
2. *White Fir*

Alpine Fir, Balsam

(*Abies lasiocarpa* Nutt.)

This tree frequents the mountainous parts of western North America, from Alaska to New Mexico and Arizona. In Colorado it is a common associate of the Engelmann spruce and with that species occurs between the elevations of 8,500 feet and timberline.

It is common along streams and in wet ground where its tall spire-like crowns vie in beauty with those of the blue spruces.

Its crown is more slenderly tapered and its foliage denser than that of the spruces.

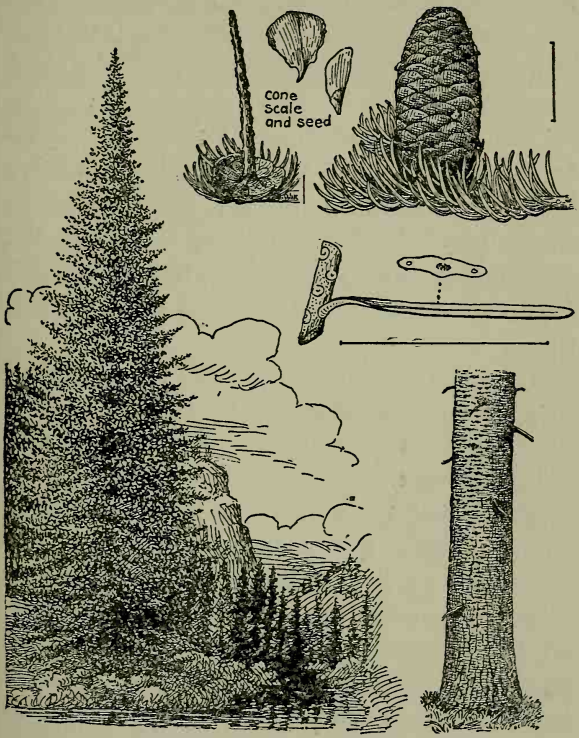


FIG. 11. Alpine fir (*Abies lasiocarpa*). Trunk of adult tree; a needle; a cone; cone scale and seed; axis of cone from which the scales have fallen

While it often reaches a height of 80 to 100 feet its trunk diameter seldom exceeds 2 feet. The bark on all but the oldest trees

remains smooth and thin with numerous resin blisters just under the outer layer and many small transverse scars. On the oldest trunks the bark at the base often cracks into hard flat ridges ½ to ¾ inch thick and of a dark gray color.

The needles are about 1 inch long, flattened and soft. A cross section under a hand lens shows two tiny resin tubes or ducts located about midway between the upper and lower sides in which character they differ from the needles of the Concolor fir.

The cones are borne on the topmost branches of the crown, are about 3 inches in length, of a purplish black color and mature in one season.

The wood is light in weight and color, spongy, weak, has a disagreeable odor and is disliked by the lumberman. It is cut into a coarse grade of lumber, which is employed where strength and durability are not important qualities. The tree has high ornamental value for situations where it is suited to the conditions, as in cool, moist locations.

Cork-bark Fir

The Cork-bark Fir (*Abies arizonica*) is considered by some botanists to be a variety

of the alpine fir. It differs from that species chiefly in its somewhat smaller size and in having the outer bark developed into soft corky ridges or projections. It occurs in the mountains of Southern Colorado, in New Mexico and Arizona.

White Fir, Concolor Fir

(*Abies concolor* Lindl.)

The White Fir extends from southern Colorado and New Mexico westward into

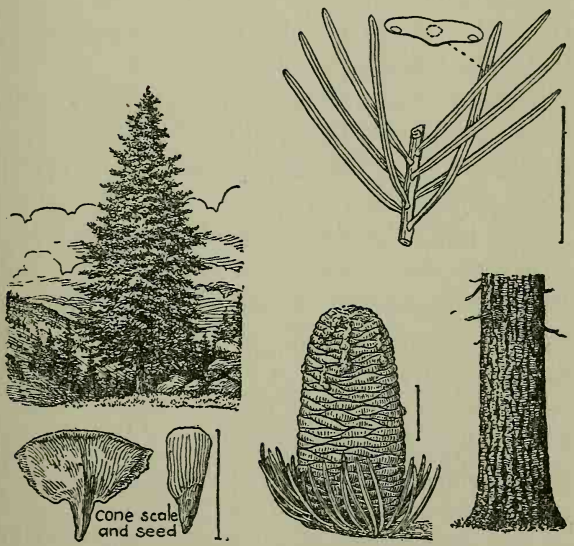


Fig. 12. White fir (*Abies concolor*). Trunk of adult tree; twig with needles; cone; cone scale and seed

California and northward into Oregon. Its occurrence in Colorado is limited to the southern half of the state, its most accessible location on the eastern side of the mountains being in North Cheyenne Canyon above Colorado Springs and Manitou.

It is a common tree on the lower mountain slopes about Ouray and southward at elevations of 9,000 feet and below. Considerable forests of it are to be found in the San Juan region of southwestern Colorado where it is lumbered to some extent.

It is a much larger tree when full grown than the alpine fir although in our region it does not reach its full size.

The form of the tree is conical and the bark, which is at first smooth, soon becomes strongly ridged and thickened on old trunks.

The bluish green needles, which are 1½ to 2½ inches long, are longer and heavier than those of the alpine fir and show the two resin tubes in cross section located close to the lower surface.

The cones are nearly twice as large as those of the alpine fir and are usually pale green or purplish green at maturity.

The wood of the white fir is similar to that of the alpine fir but is odorless and makes somewhat better lumber. Its principal use

IV. PEACH-LEAVED WILLOW WITH SINGLE TRUNK

Growing in the plains zone

is for coarse lumber, mine timbers and pulp wood. The tree is highly ornamental and is well adapted to the warmer locations of its range.

5. JUNIPERS, RED CEDARS (*Juniperus*)

Aromatic shrubs and trees, with awl-shaped or scale-shaped needles ⅛ to ½ inch long; staminate and pistillate flowers on separate trees; fruit a dry or juicy resinous berry with one to several bony-shelled wingless seeds. The heart wood is brown or red and possesses an aromatic odor.

Key

a. Low, spreading shrubs. b.
b. Needles awl-shaped, spreading, in whorls of 3. 1. *Low Juniper*
b. Needles scalelike, minute, not spreading. 2. *Creeping Juniper*
2. Trees 6 to 40 feet tall; leaves on mature branchlets scalelike, minute. c.
c. Berry ¼ to ⅓ inch long, dry, reddish brown covered with bluish bloom; heart wood brown. 3. *Utah Juniper*
c. Berry usually less than ¼ inch long, blue black with bloom, somewhat juicy; heartwood red or reddish brown. d.

d. Berry mostly one-seeded, juicy and sweet; seed thin-shelled.
4. *One-seed Juniper*

d. Berry usually 2 to 3-seeded; seed thick-shelled. 5. *Rocky Mountain Red Cedar*

1. Low Juniper, Mountain Juniper

(*Juniperus communis*, var. *montana*, var. *sibirica* of some authors)

The common juniper, of which this is a variety, extends across the northern half of the continent from Labrador to Alaska. The low juniper is confined largely to rocky hills and mountain sides where it grows either in the open or among trees of yellow and lodge-pole pine.

It extends in our state from the lower range of foothills to 10,000 feet elevation and forms low spreading shrubby masses or clumps 2 to 3 feet tall. The needles are about ⅔ of an inch long, spreading and borne in whorls of 3.

The berries are without stems, bluish in color and contain 1 to 3 seeds.

This little evergreen shrub is desirable for planting in rockeries and along walls where a low evergreen is desired. It is hardy when established but prefers a cool moist situation.

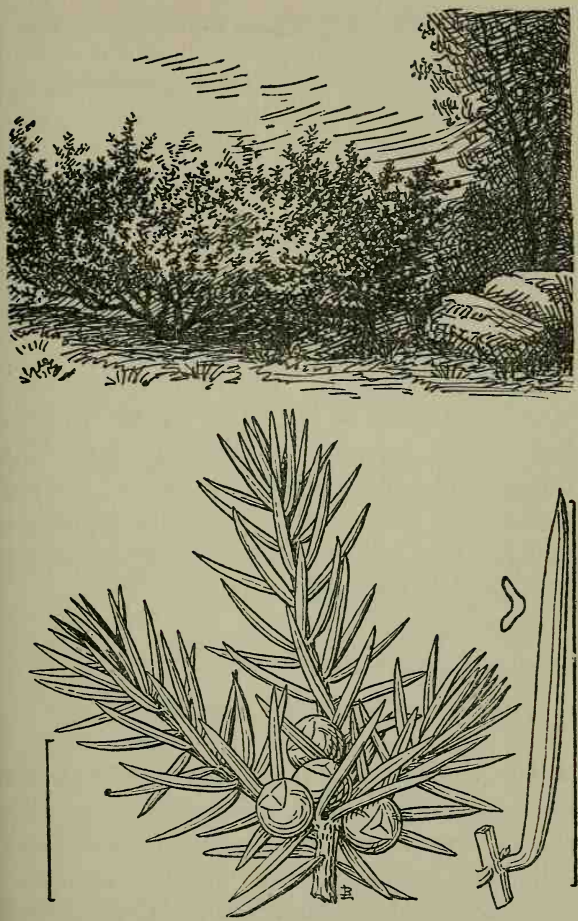


FIG. 13. Low juniper (*Juniperus communis*, var. *montana*). Twig with needles and berries; a needle enlarged

2. Creeping Juniper, Trailing Savin

(*Juniperus prostrata* (Pers.) Antoine)

The creeping juniper takes its name from its habit of spreading along the ground and taking root from the prostrate stems. It occurs mostly in the northern portion of the continent north of Colorado but is recorded by Rydberg near Colorado Springs, Parlin in Gunnison County, and from Owl Canyon in Larimer County. The author has found specimens north of the latter location, which have been referred to this species. The foliage and berries resemble those of the red cedar but the stems are wholly prostrate and rooting. It resembles the tree junipers in its scalelike leaves.

3. Utah or Desert Juniper

(*Juniperus Utahensis* (Engelm.) Ryd.)

The Utah juniper is a bushy low-branched or commonly forked, spreading tree with stocky trunk usually less than twenty feet tall. Its range is from western Colorado and northern New Mexico through Utah and Arizona into southeastern California.

It associates commonly with the pinyon pine and occupies much the same areas in

the southwestern parts of our region. It differs from the red cedar chiefly in its much coarser twigs, its yellowish green foliage with the scalelike needles often in 6 ranks, and its much larger berries with usually one large seed. The bark is stringy or shreddy and the heartwood is yellowish brown and mildly scented. It is largely used for posts and fuel where abundant.

4. The One-seed Juniper

(*Juniperus monosperma* (Engelm.) Ryd.)

This tree occurs in southern Colorado, in Texas and west to Arizona and Nevada. It

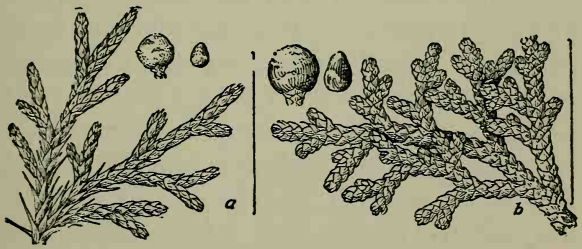


Fig. 14. (*a*) One-seed juniper (*Juniperus monosperma*). Twig; berry; seed. (*b*) Utah juniper (*Juniperus utahensis*). Twig; berry; seed

resembles in size and habit of growth the Utah juniper with which it sometimes associates, but has more slender branchlets, and smaller, mostly one-seeded, bluish or

blackish berries with sweet, resinous taste. The heart wood is brownish and is used the same as that of the other species.

5. Rocky Mountain Red Cedar

(*Juniperus scopulorum* Sarg.)

This is the true red cedar of the Rocky Mountains with a range from Alberta, British Columbia, to Texas and Arizona. It is common in Colorado all through the foothills zone especially on the Eastern side of the range where it occupies the driest, rockiest ridges in a stunted shrublike form, or the sides of moist canyons where it becomes a tree sometimes 60 to 70 feet tall and a foot or two in diameter. In young vigorous trees in moist situations the crown is broadly conical, but in old trees in dry situations it forms a spreading often irregular open crown. The trunk is often forked and low-branched and is covered, in age, by a rather thick brownish gray bark divided into narrow, flat ridges.

The needles are in the form of minute scales arranged in pairs in four ranks and entirely cover the very slender branchlets. The foliage varies from grayish or silvery green to dark green in color.

The berries are borne only on pistillate-

FIG. 15. Rocky mountain red cedar (*Juniperus scopulorum*). An old tree; twig with berries and scalelike leaves

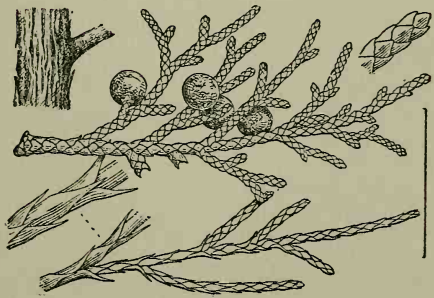


FIG. 15a

flowered trees, are about ¼ inch in diameter, blue black when ripe and covered with a white bloom. They are often borne in immense numbers on small stunted trees. The bony seeds are usually 2 or more in number.

The wood of the red cedar is fine grained with a narrow band of white sapwood and a reddish heartwood with faint purplish and whitish streaks. It possesses the same odor as the eastern red cedar wood so much used for pencils and cedar chests. The red cedar is largely used for fence posts wherever it is obtainable, as it is probably our most durable native wood. It has been also made into chests to a limited extent and is especially beautiful. The tree is very hardy and well suited for ornamental planting.

JOINT FIR FAMILY (*Gnetaceæ*)

This small family consists of shrubs or small trees with jointed stems, opposite or clustered branches and scalelike leaves in pairs or threes. The flowers are of two kinds, staminate and pistillate on separate plants. The pistillate flower consists of a single erect naked ovule, and ripens into a naked seed surrounded by numerous thin scales.

JOINT FIR (*Ephedra*)

Key

a. Branches and leaf-scales opposite.
1. *E. antisyphylitica*

a. Branches and leaf-scales in threes. b.

b. Leaf-scales not over ⅛ inch long, not shreddy. 2. *E. Torreyana*

b. Leaf-scales ¼ inch or more long, becoming shreddy. 3. *E. trifurca*

1. Mormon Tea (*Ephedra antisyphylitica*). Stems slender, loosely spreading, the older portions covered with thin gray, fibrous bark,

the branches green and resembling those of the scouring rush. It occurs on dry rocky hillsides from southern Colorado to Texas

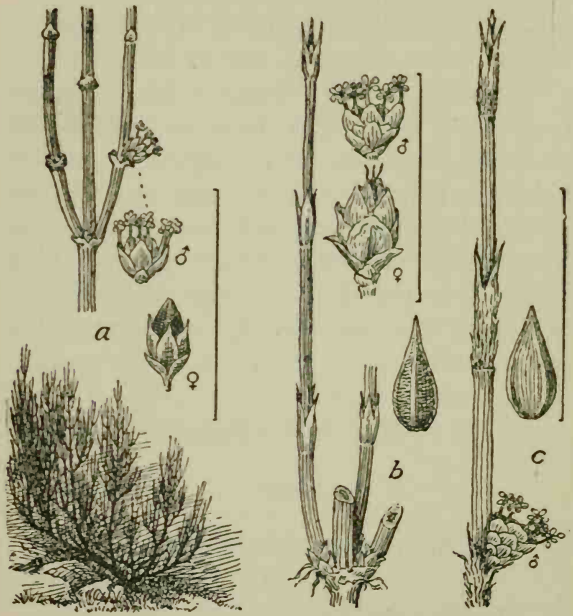


FIG. 16. Joint firs. (*a*) *Ephedra antisyphlitica*. Jointed stem with staminate flowers; a seed. (*b*) *Ephedra Torreyana*. Jointed stem; staminate and pistillate flowers; a seed. (*c*) *Ephedra trifurca*. Portion of stem with staminate flowers; a seed

and Mexico. It is sometimes employed as a domestic remedy.

2. Torrey Joint Fir (*Ephedra Torreyana*).

An erect growing species 1 to 3 feet tall with the green branches mostly in threes and in erect broom-like clusters; fruit rough. In dry places from southern Colorado to California.

2. Three-forked Joint Fir (*Ephedra trifurca*). Erect, freely branched growing to a height of 5 feet. The stiff, green branches are sharply pointed at the tip and the fruit is smooth. Range from southwestern Colorado to Utah, Arizona and Texas.

LILY FAMILY (*Liliaceæ*)

Mostly herbs with parallel-veined leaves and showy flowers with the parts in whorls of 3 (or twice 3). One genus, Yucca, has been included among the shrubs because of its evergreen leaves and the woody base of its short stem.

YUCCA, SPANISH BAYONET

(*Yucca*)

Ours are low plants with tufted, evergreen, bayonet shaped stiff leaves with sharp points growing from a short woody caudex or stem which is often branched, somewhat, just at the ground surface in old plants. Flowers large and showy, greenish white, borne on stout, erect flower stalks, followed by large seed pods. The flowers of the yuccas are pollenized by a delicate little insect, the pronuba moth.[1]

Key to the Colorado Yuccas

1. Seed pods erect, dry and splitting when ripe. 2.

[1] *Rocky Mountain Wild Flower Studies*, Longyear.

2. Leaves narrow, 1 to 2 feet long.
Y. glauca

2. Leaves rather broad, usually 6 to 8 inches long. *Y. Harrimaniæ*

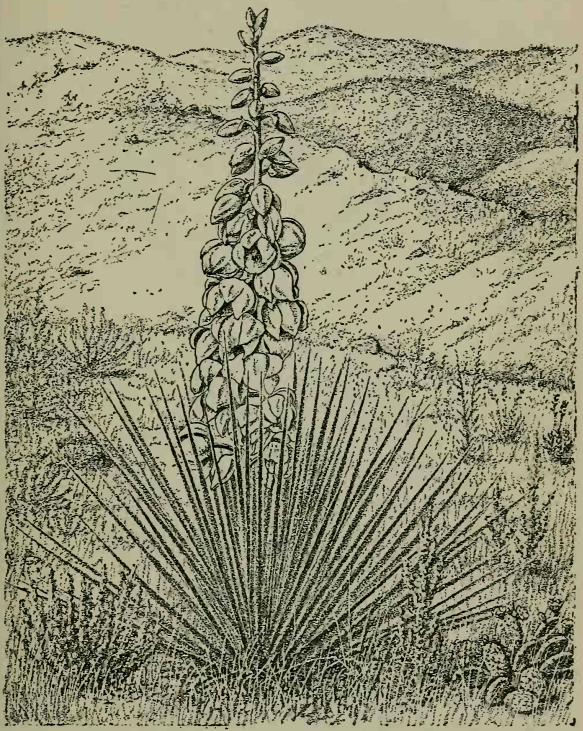


FIG. 17. Narrow-leaved yucca (*Yucca glauca*)

1. Seed pods drooping, fleshy when ripe.
Y. baccata

The common yucca of the plains is *Y. glauca* which is known as Spanish bayonet,

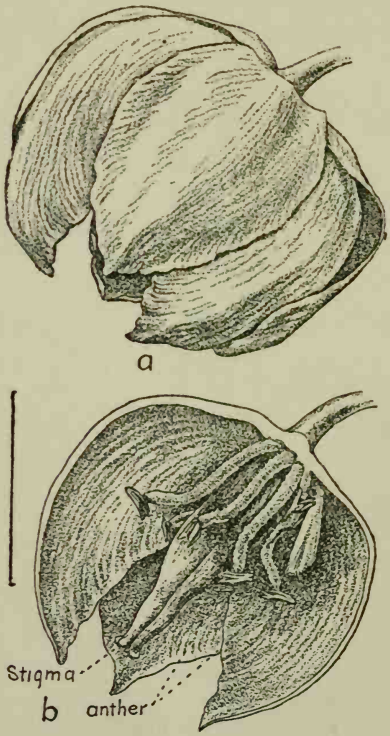


FIG. 18. (*a*) Flower of yucca. (*b*) Section of flower with pronuba moth. (*c*) Pronuba moth on stigma

soapweed and bear grass. It is common on the plains of eastern Colorado and through the lower foothills. It has been gathered in

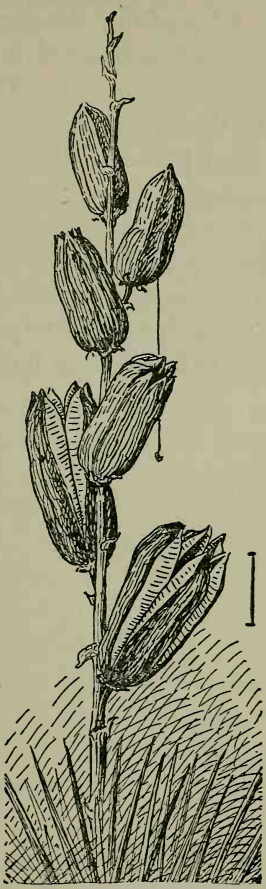


FIG. 19. Seed pods of *Yucca glauca*

some sections for use in making a soap of fine quality. All parts of the plant produce a suds or lather when bruised in water due to the presence of saponin. The Indians have long used the different species of yucca for cleansing their hair and blankets.

Y. Harrimaniæ and *Y. baccata* are both plants of southwestern Colorado and beyond into New Mexico, Utah and Arizona. The latter species bears fleshy pods 4–5 inches long which are edible when ripe and have sometimes been called Indian banana.

WILLOW FAMILY (*Salicaceæ*)

Shrubs and trees inhabiting moist or wet soil and having tiny flowers of two kinds (staminate and pistillate), crowded into elongated clusters (catkins). The staminate and the pistillate catkins are borne on different individuals of the same species. In all of the cottonwoods and in some of the willows the flowers appear before the leaves. The tiny seeds are borne in small pods that ripen in early summer and are distributed by the wind due to the cottony hairs attached to them.

Cuttings or portions of live twigs take root readily when planted in moist soil and if the cuttings are made from a staminate-flowered plant they will never bear cotton. In this way the so-called cottonless cottonwood is propagated.

Key

Trees; winter buds more or less resinous, their scales several, overlapping.

Populus—Cottonwoods, Poplars, Aspens

Trees or shrubs; winter buds dry, covered with one scale.
Salix—Willows

COTTONWOODS, ASPENS, POPLARS
(*Populus*)

The members of this genus are all trees, some of them being the largest of our broad-leaf species. They are the first trees to be met with in crossing the Great Plains toward the Rockies as they follow the streams for many miles to the eastward. They furnished the first shade trees planted by the pioneer settlers about their ranch homes and along the streets of the frontier towns where many of them are still standing.

Key

a. Bark of trunk becoming strongly ridged. b.
b. Leaf blades as broad as long, or broader. c.
c. Teeth of the leaves more than 10 on a side. 1. *Broad-leaf Cottonwood*
c. Teeth of the leaves fewer than 10 on a side. 2. *Wislizeni's Cottonwood*
b. Leaf blades longer than broad. d.

d. Petioles less than half as long as the blades. 3. *Narrow-leaf Cottonwood*

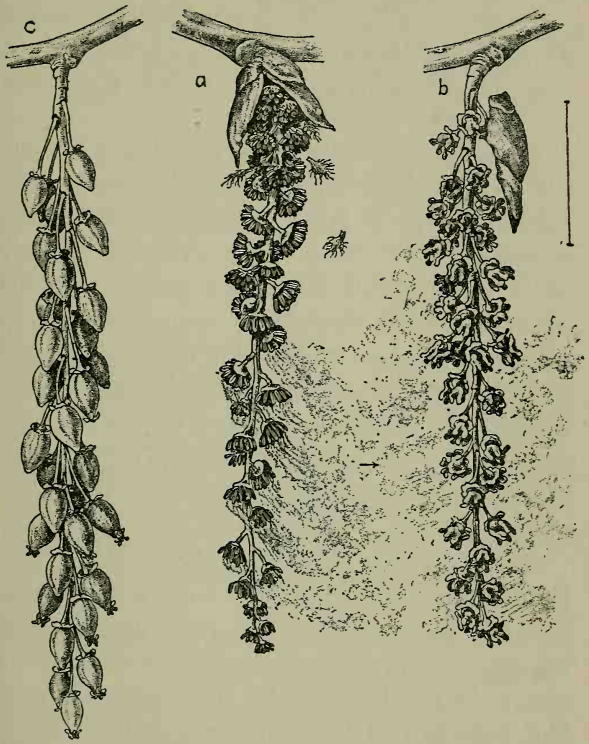


FIG. 20. Catkins of a cottonwood. (*a*) Staminate. (*b*) Pistillate. (*c*) Seed pods containing cotton-covered seeds

d. Petioles more than half as long as the blades. e.

e. Leaves pale green beneath; winter buds large. 4. *Balsam Poplar*

e. Leaves green on both sides. 5. *Lance-leaf Cottonwood*

a. Bark of trunk remaining smooth and chalky white. 6. *Aspen*

1. Western Broad-leaf Cottonwood (*Populus Sargentii* Dode). Along streams in the plains zone. A large rough-barked, coarse spreading tree with large greenish winter buds well coated with pale amber colored pitch or varnish-like resin. Quite extensively planted in the early days for windbreaks and shade in the irrigated sections of the Great Plains. It is closely related to the eastern cottonwood or Carolina poplar so extensively planted as a street tree all through the western plains.

2. Wislizeni's Cottonwood (*Populus Wislizenii* Sarg.). A rather common cottonwood in southwestern Colorado and beyond where it occurs along streams in the plains zone. It much resembles the western broad-leaf in size and habit of growth but differs in its very coarsely toothed leaves, which are sometimes almost entire margined, and in its long-stalked seed pods. It is planted as a street tree within its range.

3. Narrow-leaf Cottonwood (*Populus an-*

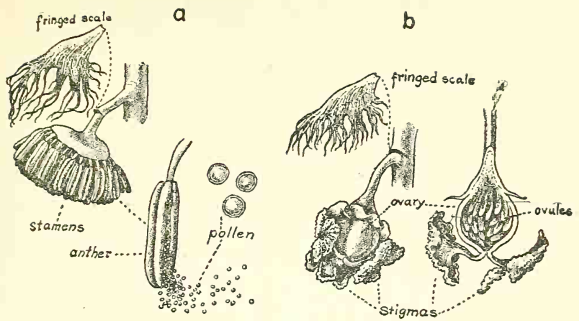


FIG. 21. Cottonwood flowers enlarged to show their structure. (*a*) Staminate flower. (*b*) Pistillate flower

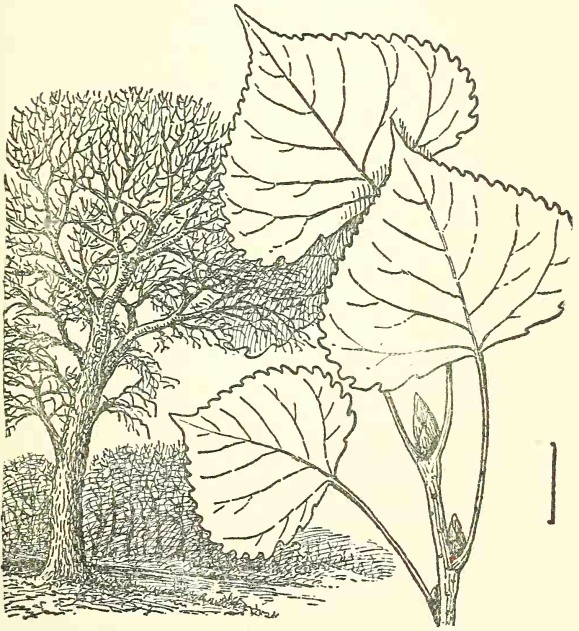


FIG. 22. Western broad-leaf cottonwood (*Populus Sargentii*)

gustifolia James). A common tree along streams and in canyons from the upper plains to the sub-alpine zone. It is not usu-

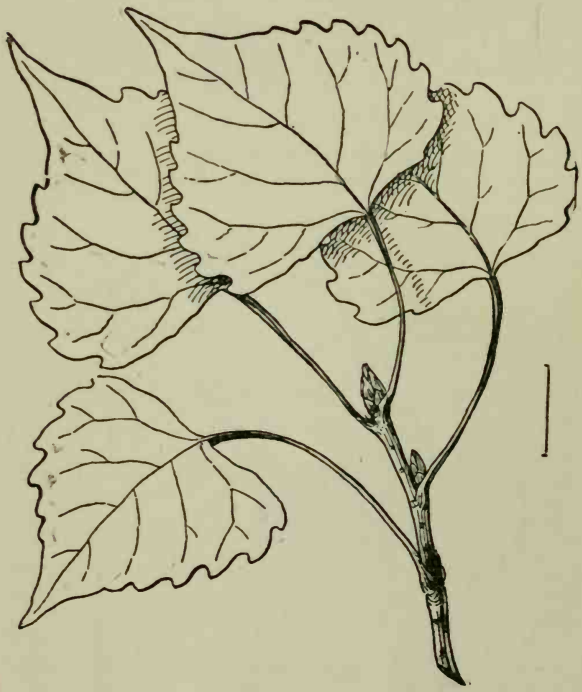


FIG. 23. Wislizeni's Cottonwood (*Populus Wislizeni*)

ally as large a tree as the broad-leaf and the lance-leaf cottonwoods. It is more slender, with erect upper branches and with smooth whitish bark on the upper part of the trunk

and on the larger limbs. Its leaves resemble those of some of the willows and have short petioles and finely toothed margins. The winter buds are small, narrow and are coated

FIG. 24. Narrow-leaf Cottonwood (*Populus angustifolia*)

with a dark red resin having a pronounced aromatic odor.

This is the common cottonwood of the high altitudes where it is often almost the

only broad-leaf tree planted as a shade and street tree.

4. Balsam Poplar (*Populus balsamifera* L.). This is a much less common tree in Colorado than the preceding species but oc-

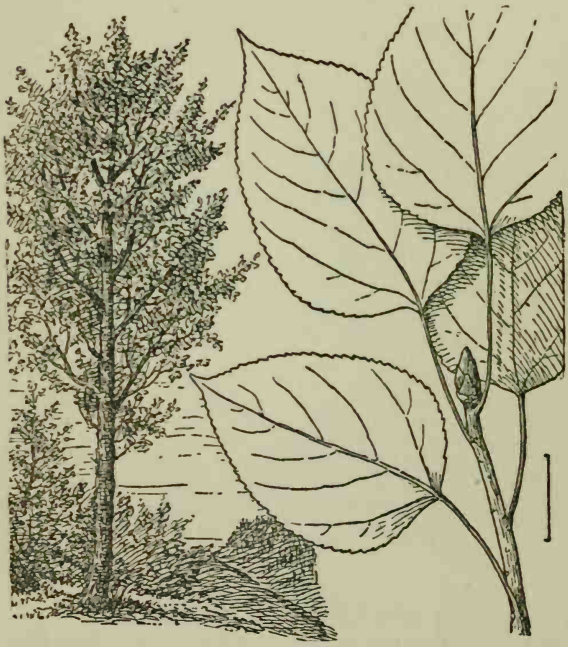


FIG. 25. Balsam poplar (*Populus balsamifera*)

curs occasionally along streams and in canyons in the mountains at elevations between 7,000 and 8,000 feet. It is a medium sized tree with smooth gray bark on the upper part

of the trunk and the rather erect limbs. The ovate leaves are dark green above, lighter and somewhat pubescent underneath and the buds

FIG. 26. Lance-leaf cottonwood (*Populus acuminata*)

are large and heavily coated with fragrant resin.

The balsam poplar is occasionally planted as a shade tree in this state but is coarse and apt to be short lived.

5. Lance-leaf Cottonwood (*Populus acu-*

minata Rydb.). Along streams in the upper part of the plains zone of eastern Colorado and in a few localities on the western slope. It is less common than the broad-leaf cottonwood from which it differs in its smoother, lighter colored bark and smaller more pointed leaves. While it equals in size the former species it is a more erect tree with slenderer twigs and light brown winter buds. Like the former species it has been planted as a street tree within its range and is still the chief native cottonwood on the streets of Fort Collins, Colorado, and may be found in limited numbers in Colorado Springs and Montrose.

Populus Andrewsii Sarg., believed to be a natural hybrid between *P. Sargentii* and *P. acuminata*, has been found near Boulder, Walsenburg, and as a street tree in Montrose, Colorado. It is intermediate in character between the two species.

6. Aspen, Quaking Asp (*Populus tremuloides* Michx.). A common tree on moist slopes and in valleys all through the mountains between 6,000 and 10,000 feet elevation. The aspen differs from the other members of the genus in our region by its chalky white or greenish white bark which remains smooth even on the oldest trees, except for dark colored, warty excrescences across the trunk

especially at the base. It is a rather small or medium sized tree which often forms dense clumps or groves of many individuals of even size and clean trunks. Its leaves are

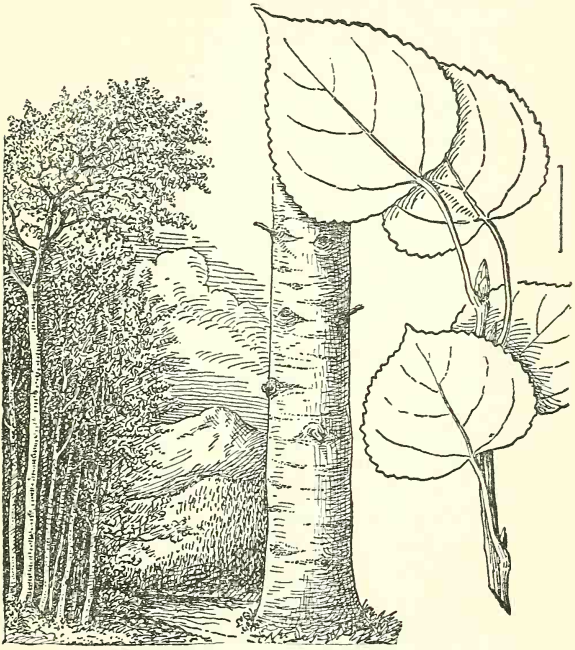


FIG. 27. Aspen (*Populus tremuloides*)

always in motion where the air is stirring due to the slender flattened petioles.

It sprouts freely from the roots and is usually the first tree to appear after a forest fire. The sapwood is white, heartwood

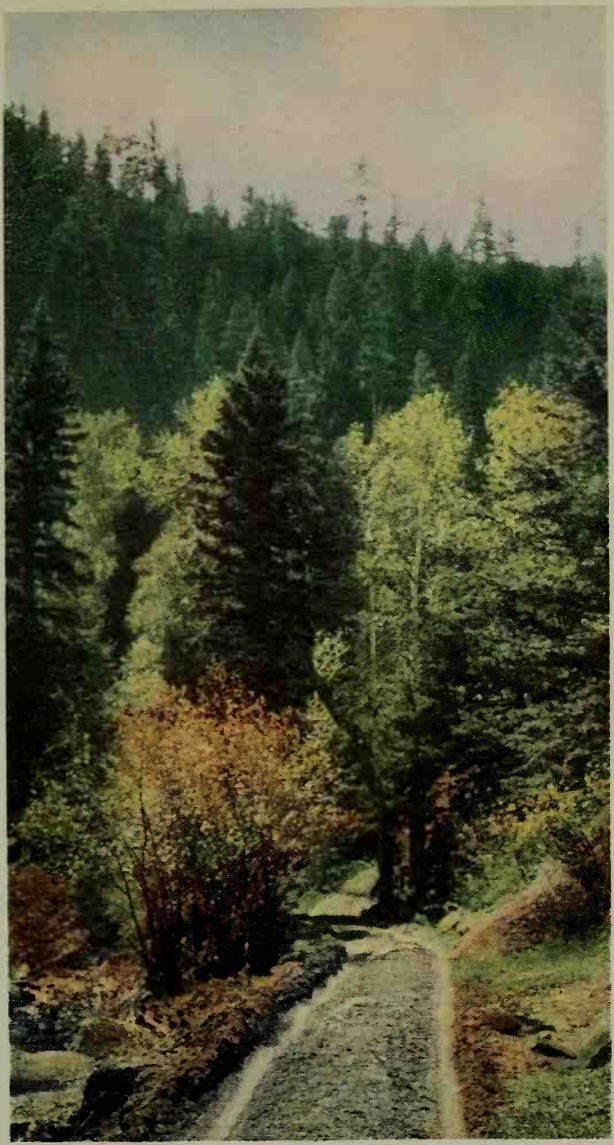
brownish, light in weight and excellent for paper pulp, excelsior and for the sticks of safety matches. It is also used locally for poles, posts, mine timbers and for fuel and charcoal. It is but little planted for a shade tree except in mountain towns.

THE WILLOWS (*Salix*)

More than thirty species of willows are recognized by botanists as occurring in this region. Of this number only two merit the name of tree, the others ranging in size from low creeping plants, only a few inches high, to tall shrubs that are almost trees. They grow mostly in wet ground and occur from the eastern plains to above timber line. The leaves of willows are usually narrow although a few species have broad rounded leaves. The bark on the twigs is very bitter when chewed due to the presence of an active principle, salicin. On account of the difficulty of separating the different species, which even the expert botanists are not agreed upon, only a few of the commoner and more easily recognized species are here described.

Key

a. Trees 15–40 feet tall, with rough bark. b.



V. A CANYON ROAD IN THE FOOTHILLS ZONE IN AUTUMN

Douglas fir in the foreground and on the slope. Aspens near the road and birches and willows along the stream

b. Leaves yellowish green; twigs yellowish. 1. *S. amygdaloides*

b. Leaves dark green; twigs gray or brownish. 1a. *S. Wrightii*

a. Tall shrubs, sometimes treelike; bark smooth. c.

c. Leaves not very narrow. d.

d. Seed pods long-stalked. 2. *S. rostrata*

d. Seed pods short stalked. 3. *S. Nuttallii*

c. Leaves mostly very narrow. e.

e. Stems numerous, crowded; fruiting catkins not very showy. f.

f. Twigs gray or yellowish, without bloom. 4. *S. exigua*

f. Twigs purplish or brownish, covered with a bluish bloom. 5. *S. irrorata*

e. Stems few; fruiting catkins showy. 6. *S. Fendleriana*

a. Low shrubs or creeping plants. g.

g. Leaves not rounded; stems erect. 7. *S. glaucops*

g. Leaves rounded; stems creeping. 8. *S. saximontana*

1. Almond or Peach-leaf Willow (*Salix amygdaloides*). This is the common tree willow of the plains near the mountains and in canyons up to 7,000 feet elevation. In

our region it is a small or medium sized tree rarely 40 feet tall and one foot through and often grows in clumps of several spreading individuals.

The leaves are yellowish green above and whitish or pale underneath and resemble in

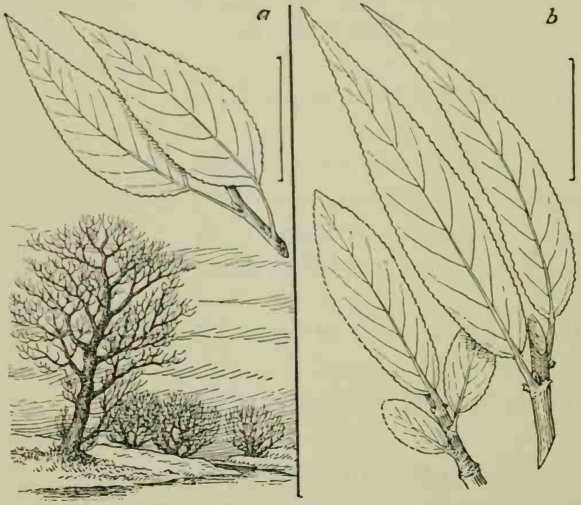


FIG. 28. (*a*) Peach-leaf willow (*Salix amygdaloides*). (*b*) Wright's willow, Western Black Willow (*Salix Wrightii*)

shape those of the common peach. It is a slow-growing tree and suited for ornamental planting in moist ground or under irrigation. A variety of the peach-leaf willow (*S. Wrightii* Anders), with longer and narrower leaves,

deep green on both sides, occurs in the eastern part of the region under the name Western Black Willow.

2. Beaked Willow (*Salix rostrata*). A tall shrub or sometimes a small tree common

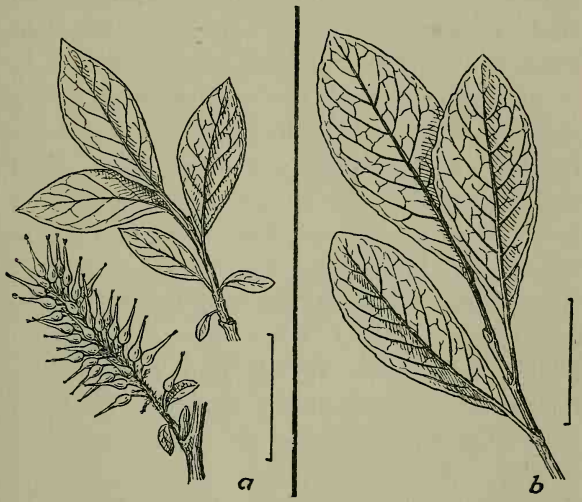


FIG. 29. (*a*) Beaked Willow (*Salix rostrata*). (*b*) Nuttall's willow (*Salix Nuttallii*)

along streams from the lower foothills up to the sub-alpine zone where it is often found on moist slopes in open woodlands growing in clumps of a few stems. The capsules or pods of the seed-bearing catkins are borne on long stalks and each pod is prolonged at the tip. (*Salix Bebbiana* of some authors.)

3. Nuttall's Willow (*Salix Nuttallii*). A tall shrub rather common along streams in the foothills and montane zones. The leaves and slender twigs are sometimes pubescent.

4. Narrow-leaf Willow (*Salix exigua*). A shrub of variable habit from a rather low slender sprouting plant forming patches of considerable extent, to tall erect clumps. It is one of our most common willows along streams, irrigation ditches and on wet ground from the plains to the sub-alpine zone. The catkins appear with the leaves. The slender twigs are smooth and brown or reddish in color and the stems or trunks are gray. The young twigs and the long slender leaves are often covered with fine silky hairs. (*Salix stenophylla* Rydb. and *Salix luteosericea* Rydb. are included under this species.)

5. Glaucous-stemmed Willow (*Salix irrorata*). A shrub of medium height and spreading habit common along streams in the foothills and lower mountains. It is easily recognized by its purplish or yellowish twigs which are coated with a bluish or whitish bloom easily rubbed off from the smooth twigs.

The catkins appear before the leaves and it is one of the common "pussy willows" of our region. A good ornamental shrub.

Gyer's Willow (*Salix Gyeriana*) resembles

the foregoing species in having its twigs covered with a bluish bloom but its leaves are smaller and silky and the twigs are nearly black when the bloom is rubbed off.

6. Fendler's Willow (*Salix Fendleriana*). This is a large shrub, occasionally almost a tree, with stout, shining, reddish or yellow-

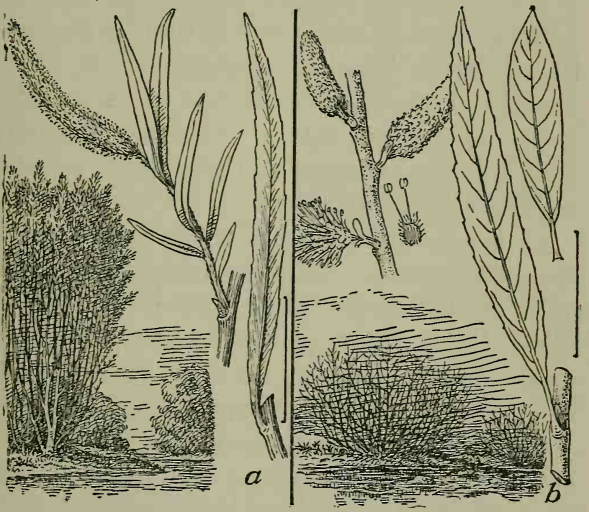


FIG. 30. (*a*) Narrow-leaf willow (*Salix exigua*). (*b*) Glaucous-stemmed willow (*Salix irrorata*)

ish-red twigs and dark green leaves. This is one of our most showy willows when the tan-colored seed pods are bursting and discharging their white masses of cotton in early summer. It is rather common along

the streams which flow through the canyons of the foothills and mountains and reaches an elevation of 10,000 feet.

7. Sub-alpine Willow (*Salix glaucops*). A low but erect shrub usually 2–3 feet tall, common in boggy places in the higher elevations and extending above timber line. The general tone is grayish due to the finely hairy young twigs, the leaves and the flowering catkins. The older stems are at first chestnut brown and shiny but become gray with thin papery scales. The rather small leaves are entire-margined and show a network of veins underneath.

8. Rocky Mountain Creeping Willow (*Salix saximontana*). This little creeping shrub, only a few inches high, would hardly be taken for a willow at first sight. It forms dense matted growths on exposed wet soil usually above timber line.

Its leaves, unlike those of most willows, are nearly as broad as long and are rounded in outline. The catkins are small and the seed pods or capsules are short and covered with fine short hairs.

Another small willow of similar size and habit of growth (*Salix petrophila*) occurs among rocks above timber line. It differs from the former species in its elongated leaves, yellowish twigs and blackish catkin-scales.

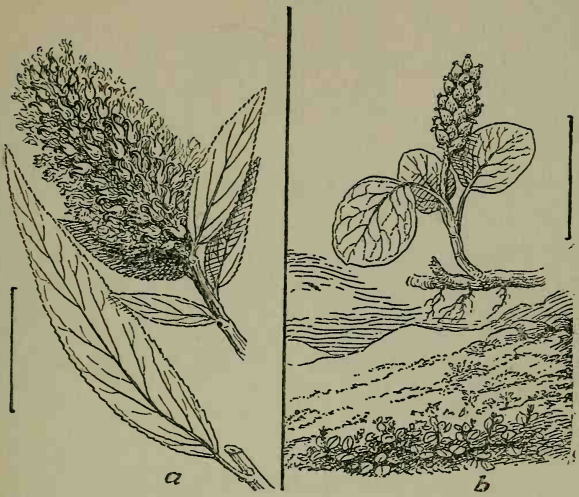


FIG. 31. (*a*) Fendler's willow (*Salix Fendleri*). (*b*) Rocky mountain creeping willow (*Salix saximontana*)

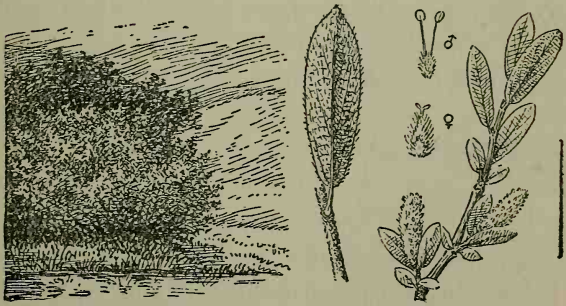


FIG. 32. Sub-alpine willow (*Salix glaucops*)

BIRCH FAMILY (*Betulaceæ*)

Shrubs or trees with simple, alternate leaves toothed on the margins; flowers borne in separate catkins or clusters on the same plant; fruit minute, seedlike winged nutlets or a thick shelled nut.

Key

1. Shrubs; fruit a nut enclosed in a leafy husk. *Hazelnut—Corylus*
1. Shrubs or small trees; fruit borne in small conelike catkins. 2.
2. Fruit conelike, scales persistent. *Alder—Alnus*
2. Fruit a catkin, scales deciduous. *Birches—Betula*

Beaked Hazelnut (*Corylus rostrata*). This interesting shrub of medium height is a near relative of the eastern hazel and the European filbert. It occurs rather commonly along streams in canyons in the foothills zone in

FIG. 33. Beaked hazel (*Corylus rostrata*)

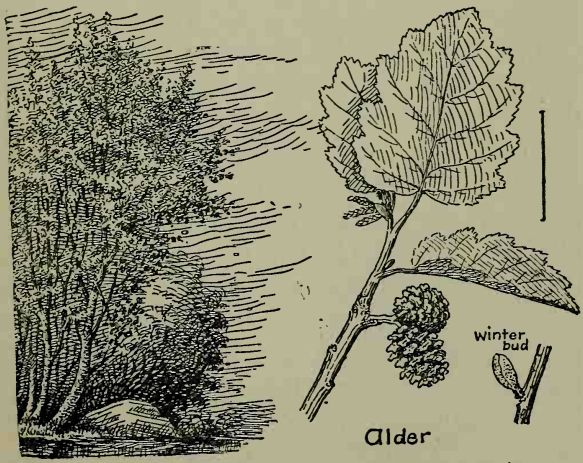


FIG. 34. Mountain alder (*Alnus tenuifolia*)

northeastern Colorado and northward. The nuts are edible and the shrub, although slow-growing, is hardy and attractive as an ornamental.

Mountain Alder (*Alnus tenuifolia*). The alder is one of our most common larger shrubs, or sometimes a small tree, along the cold mountain streams from the foothills to elevations of 10,000 feet. The smooth, dull, brownish gray bark is marked with numerous small warty swellings or lenticels. The leaves are rather large, with prominent veins and doubly toothed margins. The little conelike catkins stay on the branches over winter and aid greatly in recognizing the plant.

The alder may be used as an ornamental tall shrub in moist ground in the mountains, or on the plains with irrigation.

Rocky Mountain Birch (*Betula fontinalis*). A tall slender-stemmed shrub, or sometimes a small tree, along mountain streams to altitudes of 9,000 feet. It is a common associate of the alder from which it differs in its more slender stems and twigs covered with glossy reddish brown bark marked with small lenticels of a lighter color. The leaves are smaller than those of the alder and the catkins lose their scales as winter advances.

FIG. 35. Rocky mountain birch (*Betula fontinalis*)

This birch is very well suited for planting wherever a tall shrub is desired especially in moist places in the mountains.

Mountain Bog Birch, Dwarf Birch (*Betula glandulosa*). A bushy shrub, usually under 6 feet in height, growing in boggy ground and along streams in the mountains between 9,000 and 11,000 feet elevation. The dark colored twigs are thickly covered with small whitish glands, whence the botanical name glandulosa, and the small leaves are rounded in outline and finely toothed.

Andrews' Birch (*Betula Andrewsii* A. Nels.). This birch is closely related to the paper birch of the northeastern states and Canada but grows in clumps of several small trunks. The bark is whitish in color and peels off in thin layers. It has been found in only one locality, on Green Mountain near Boulder, Colorado.

The Paper or Canoe Birch (*Betula papyrifera*) occurs in the Black Hills region of northeastern Wyoming and in the Dakotas, thence northward across the continent from east to west. It is usually a tree of medium size with smooth creamy white bark which peels off in thin papery sheets. The bark has long been used by the Indians in the construction of their canoes and domestic utensils.

The tree is desirable for ornamental planting although the similar European White

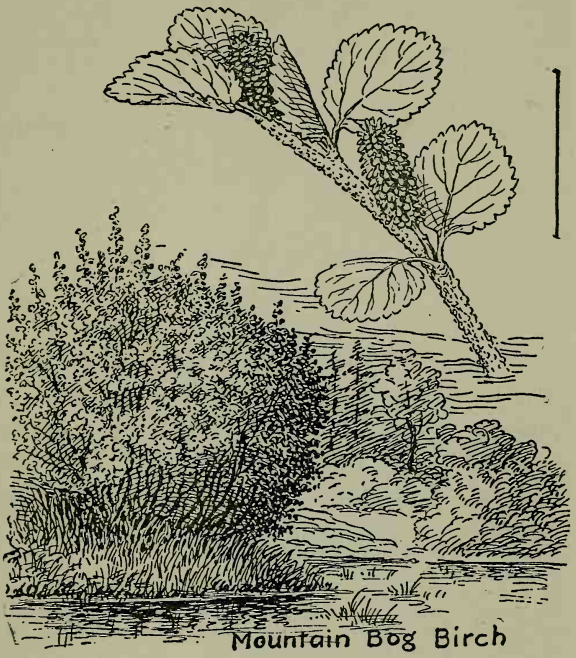


Fig. 36. Mountain bog birch (*Betula glandulosa*)

Birch (*B. alba*) is more commonly planted, especially the weeping, cut-leaf form.

BEECH FAMILY (*Fagaceæ*)

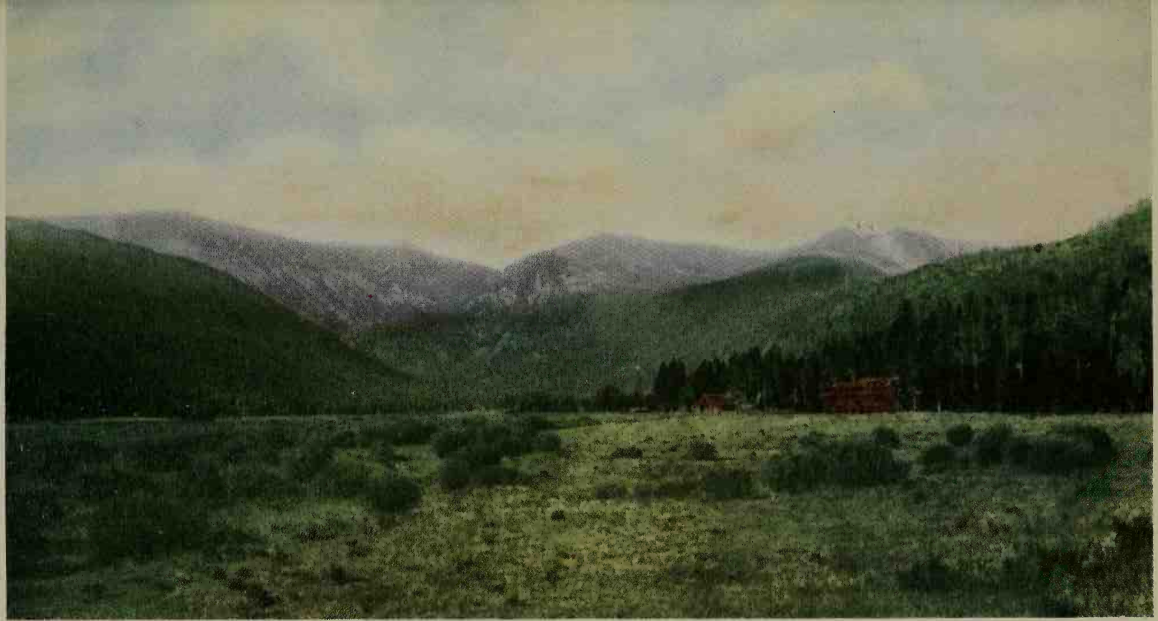
This large and important family is represented in our state by only one genus:

THE OAKS

(*Quercus*)

The oaks of this region are chiefly large shrubs and grow to the stature of trees in only a few cases. Members of this genus are most easily known by their fruit which is commonly called an acorn, a thin-shelled nut borne in a woody cup covered with small scales.

The leaves are arranged alternately on the twigs and are usually more or less deeply lobed. The stamen-flowers are borne in slender catkins and the pistillate ones are single or in clusters of two or three on the same branch. Six species, conservatively treated, occur in the region. In Colorado, on the eastern side of the mountains, they occur as far north as the foothills west of Denver while on the western slope they



VI. A SMALL MOUNTAIN PARK AT 9000 FEET ELEVATION

Shrub willows in foreground, lodgepole pine forest on right slope, engelmann spruce forest on central and left slopes

reach the lower slopes above Steamboat Springs.

Key

a. Becoming small or medium-sized trees. b.
b. Leaves velvety on lower surface. 1. *Utah Oak*
b. Leaves naked on lower surface. 2. *Colorado Oak*
a. Small to large shrubs; scrub oaks. c.
c. Leaves persistent, toothed or nearly entire. 3. *Evergreen Scrub Oak*
c. Leaves deciduous, lobed. d.
d. Acorn cup covering less than ¼ of the nut. 4. *Vreeland's Scrub Oak*
d. Acorn cup covering more than ¼ of the nut. e.
e. Nut with blunt tip. 5. *Gunnison Scrub Oak*
e. Nut with pointed tip. 6. *Gambell's Scrub Oak*

1. Utah Oak (*Quercus Utahensis*). A large shrub or small tree in the foothills and lower montane zone from southern Wyoming through Utah and western Colorado, reaching the eastern slope near Palmer Lake, thence southward into New Mexico.

2. Colorado Oak (*Quercus leptophylla*). A tree of small to medium size in the foothills zone from northwestern Colorado into New Mexico, reaching the eastern slope, in Colorado, near Colorado Springs. A number of

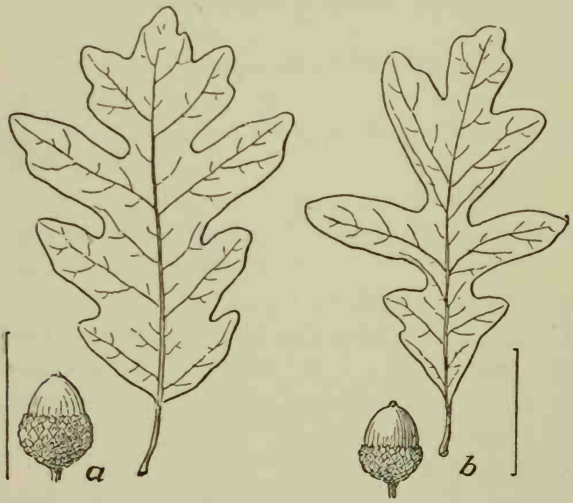


FIG. 37. (*a*) Gambell's scrub oak (*Quercus Gambellii*). (*b*) Utah oak (*Quercus utahensis*)

good sized trees of this species occur near the Spruce Tree cliff dwelling in the Mesa Verde National Park in southwestern Colorado.

3. Evergreen Scrub Oak (*Quercus undulata*). A shrub of small to large size forming clumps and thickets on dry hillsides from Utah into western Colorado, southward into

New Mexico. Leaves firm, shining, toothed or nearly entire, persistent or tardily deciduous.

4. Vreeland's Scrub Oak (*Quercus Vreelandii*). A low thicket-forming shrub

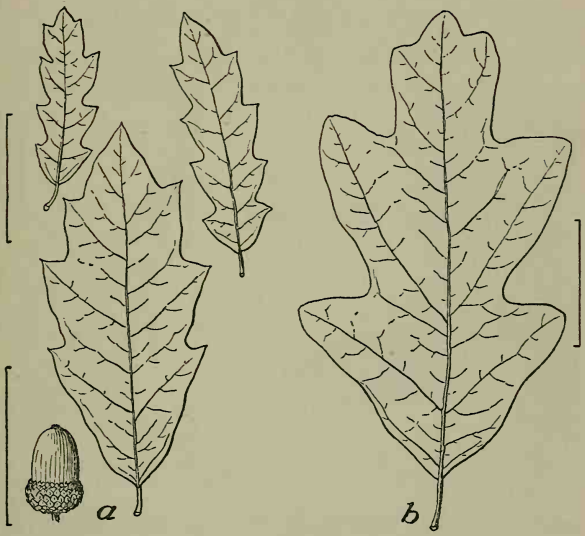


FIG. 38. (*a*) Evergreen Scrub Oak (*Quercus undulata*). (*b*) Colorado oak (*Quercus leptophylla*)

through the southern half of Colorado in the foothills and montane zone. Cup of the acorn shallow, covering one-fifth to one-sixth of the length of the acorn.

5. Gunnison Scrub Oak (*Quercus Gunnisonii*). A small to large shrub growing in

clumps and thickets over much the same range as the preceding species. Leaves lobed half way to the midrib; acorn cup covering about one-third the length of the

FIG. 39. Gunnison scrub oak (*Quercus Gunnisonii*)

nut. This is probably our commonest scrub oak in Colorado.

6. Gambell's Scrub Oak (*Quercus Gambellii*). A medium to large shrub or, rarely, a small tree, extending from Utah into Colorado and New Mexico. Leaves thinner and more deeply lobed than in the preceding species; acorn cup covering about one-half of the nut.

THE MISTLETOE FAMILY
(*Loranthaceæ*)

These curious little plants, in this region, are parasites upon the branches and trunks of evergreen trees which are thereby often

FIG. 40. Lesser mistletoe on lodgepole pine (*Arceuthobium americanum*)

deformed or are stimulated into putting out a dense growth of stunted twigs or "witches'

brooms." The stems of our mistletoes are freely branched, leafless, except for tiny scales, and are either yellowish or greenish yellow in color.

They produce tiny flowers at the tips of the branchlets followed by small white berries. The seeds are enveloped in a sticky mucilage which causes them to stick to twigs of the host trees where they may germinate and take root.

The Lesser Mistletoes (*Arceuthobium*) comprise most of the species which occur in our region.

The limber pine and the lodgepole pine bear *Arceuthobium americanum.*

The yellow pine is attacked by *Arceuthobium cryptopodum,* while the pinyon pine is host plant to *Arceuthobium divaricatum* and *A. cyanocarpum.*

These parasites often do considerable damage to the trees upon which they grow by lowering their lumber value.

The Juniper Mistletoe (*Phoradendron juniperinum*) is another mistletoe similar to the foregoing but it is a parasite upon the branches of the junipers. It is common especially in the western part of the region upon the Utah juniper and the one-seed juniper.

THE ELM FAMILY (*Ulmaceæ*)

The Elms and Hackberries

The Hackberry, Sugarberry (*Celtis occidentalis*). This tree in our region is usually

Fig. 41. Hackberry (*Celtis occidentalis*)

a small tree, or sometimes stunted when growing in dry rocky places, and is mostly confined to the foothills. It is usually found in open gulches and canyons, on rocky hillsides or sometimes among the rocks at the foot of a cliff. It is nowhere plentiful. It is a hardy and valuable tree for planting. (This includes *Celtis reticulata* of Rydberg's *Flora of Colorado.*)

GOOSEFOOT FAMILY
(*Chenopodiaceæ*)

Most of the plants of this large family are herbaceous and many of them are common weeds on waste ground and in cultivated places.

The commonest shrubby members of the family are the saltbushes and greasewoods.

The Saltbushes (*Atriplex*)

More than a dozen species of this genus occur in our region but of these three only are here counted as shrubs. They are rather low, freely branched, sometimes thorny, and the foliage and stems are scurfy or silvery and often have a salty taste. They grow in alkaline soils or on clay banks and shale ridges.

The flowers are small, staminate and pistillate separate, and the fruits are dry and somewhat winged. The presence of these plants usually indicates a saline condition of the soil.

1. Gray Saltbush, Orache, "Chicobrush"

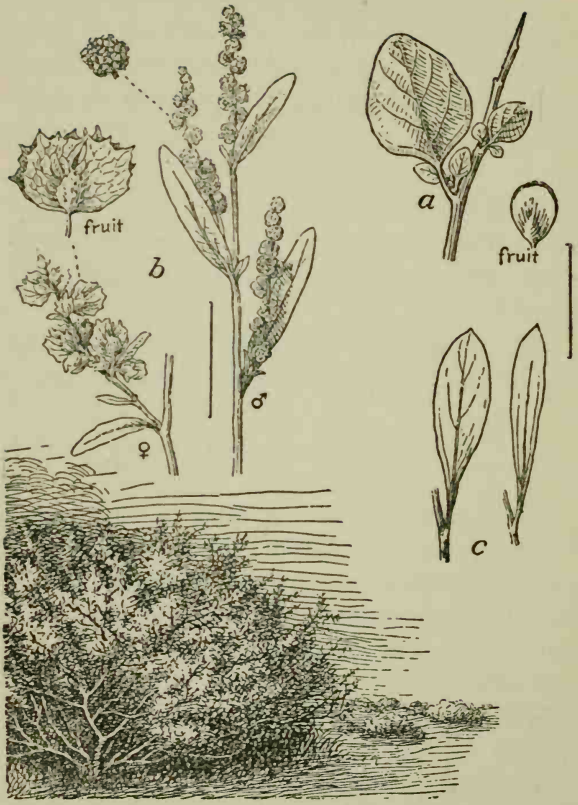


FIG. 42. (*a*) Round-leaved saltbush (*Atriplex confertifolia*). (*b*) Gray saltbush (*Atriplex canescens*). (*c*) Hop sage (*Atriplex Nuttallii*)

(*Atriplex canescens*). A spreading shrub 2 to 3 feet high growing on clay banks and alkaline soils of the plains and lower valleys of the foothills of the region.

2. Nuttall's Saltbush (*Atriplex Nuttallii*). A low shrub usually about one foot high;

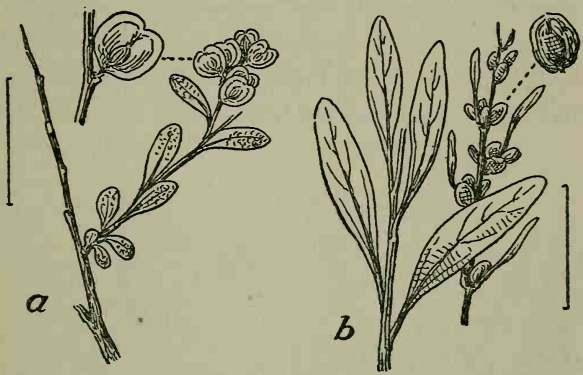


FIG. 43. Grayia. (*a*) *Grayia spinosa*. (*b*) *Grayia Brandegii*

leaves widest at the apex. It occurs on soils with little or no saline properties, chiefly on the plains.

3. The Round-leaf Saltbush (*Atriplex confertifolia*). A somewhat spiny shrub 1 to 3 feet high of spreading habit, common on saline soils from Wyoming southward and westward. It sometimes forms dense growths of considerable extent.

Very similar in general appearance to the saltbushes are two species of Grayia which differ from the former genus chiefly in having the edge of the fruit toward the stem of the plant while in the saltbushes the side of the fruit is toward the stem. Two species occur in our region. The first, *G. spinosa*, with spiny stems 1 to 3 feet tall. The second, *G. Brandegii*, lower and without spines. They occur in desert and alkaline soil chiefly in the western part of the region and southward.

FIG. 44. Greasewood (*Sarcobatus vermiculatus*). Flowering branch showing staminate and pistillate flowers; fruiting branch

Greasewood (*Sarcobatus*)

1. Common Greasewood (*Sarcobatus vermiculatus*). A common shrub 2 to 8 feet high growing on moist saline soils and on dry flats. In Colorado it occurs chiefly through the southern half of the state, also in North Park, on both sides of the mountains. It is readily known by its narrow, fleshy leaves and white-barked, spine-tipped stems from which the fresh bark readily slips when bruised.

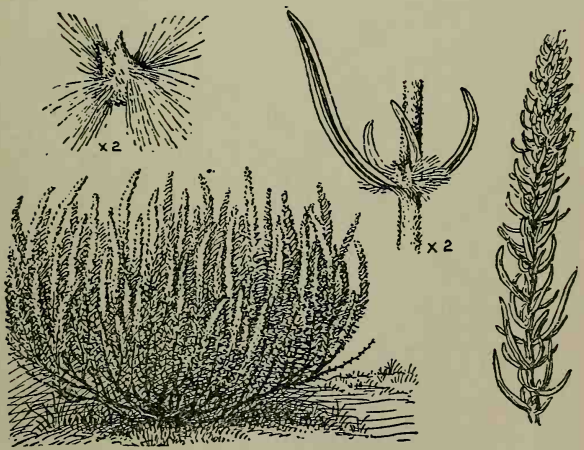


Fig. 45. White sage or winter fat (*Eurotia lanata*). Flowering branch; fruit with tufts of hairs, enlarged

Winter Fat, White Sage (*Eurotia lanata*). This is a low shrub with many erect, white-

wooly branches from the woody base. It is a conspicuous low plant on the plains and hillsides between elevations of 4,000 and 8,000 feet over a large part of the region. It is regarded as having considerable forage value.

BUTTERCUP FAMILY
(*Ranunculaceæ*)

Clematis, Virgin's Bower

Common Virgin's Bower (*Clematis ligusticifolia*). A somewhat woody vine which

Fig. 46. Clematis or virgin's bower (*Clematis ligusticifolia*)

clambers over rocks and bushes by means of its twining leaf stalks. It occurs in can-

yons and along streams in the upper plains and in the foothill zones. The abundant white flowers are of two kinds, staminate and pistillate on distinct plants, and the pistillate flowers are followed in autumn by feathery bunches of seedlike fruits. This is a useful vine for ornamental planting on lattices, arbors and fences.

THE BARBERRY FAMILY
(*Berberidaceæ*)

The plants of this family, in our region, are all shrubs with simple or compound, prickly leaves or stems, small yellow flowers and fruit a berry. The stems and especially the roots contain a bright yellow substance (berberin) with very bitter taste and of considerable medicinal value.

Key

a. Stems low and spreading; usually less than one foot long.
1. *B. aquifolium*

a. Stems erect, usually two or more feet tall. b.

b. Stems slender; 2 to 3 feet tall.
2. *B. Fendleri*

b. Stems stouter, 5 to 10 feet tall.
3. *B. Fremontii*

1. Oregon Grape (*Berberis aquifolium*). This little shrub is found everywhere through the mountains below 10,000 feet in canyons

and open woodlands from British Columbia to New Mexico and California. The evergreen leaves resemble those of the eastern holly in some respects. Its common name

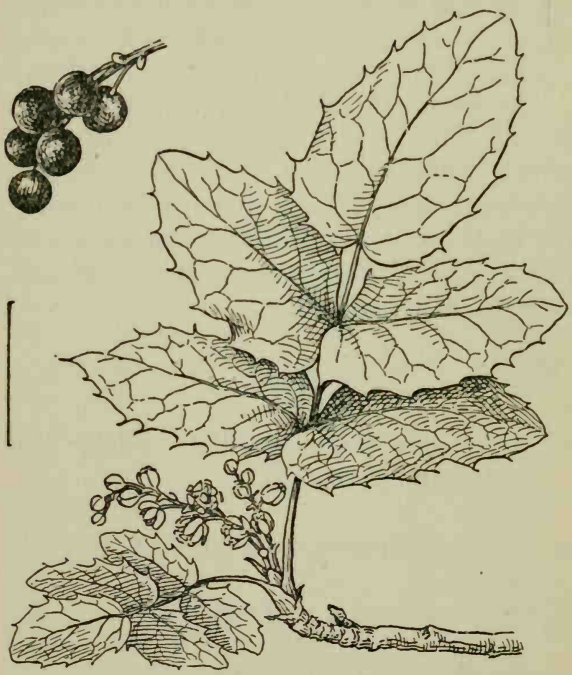


FIG. 47. Oregon grape (*Berberis aquifolium*)

is taken from the resemblance of its berries to those of the wild grape.

2. Fendler's Barberry (*Berberis Fendleri*). This barberry resembles the common bar-

berry from Europe but is not so tall. It occurs on hillsides and in valleys in south-

FIG. 48. Fendler's barberry (*Berberis Fendleri*)

western Colorado and into New Mexico. The oval berries are red.

3. Fremont's Barberry (*Berberis Fremontii*). A tall shrub of uncommon occur-

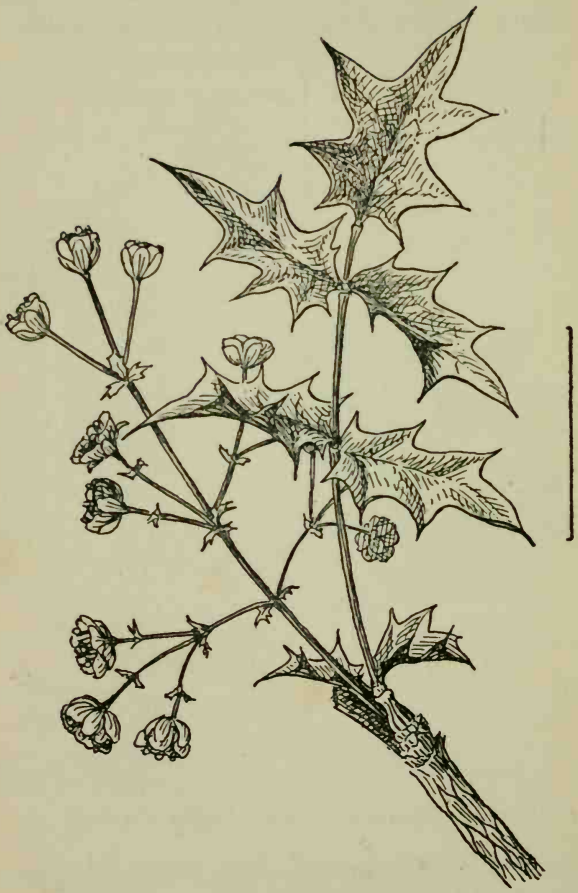


FIG. 49. Fremont's barberry (*Berberis Fremontii*)

rence in canyons among the mountains of southern Colorado, Utah, New Mexico and Arizona. The ovate berries are dark blue when ripe.

GOOSEBERRY FAMILY
(*Grossulariaceæ*)

Gooseberries and Currants

These are all shrubs with erect, spreading or arching stems which sometimes take root at the tips; leaves usually rounded in outline and palmately lobed; flowers short and bell-shaped or long and tubular; fruit a berry with several small hard seeds.

The genus may be subdivided into two parts as follows:

a. Stems usually prickly. The Gooseberries
b. Stems without prickles. The Currants

The following species are the commoner ones of the region:

Key

a. Stems more or less prickly or spiny. b.
a. Stems without prickles. e.
b. Flowers 1–4 in a cluster; calyx tube tubular or bell-shaped. c.
c. Spines single, short or lacking; stems usually prickly. 1. *R. saxosum.*

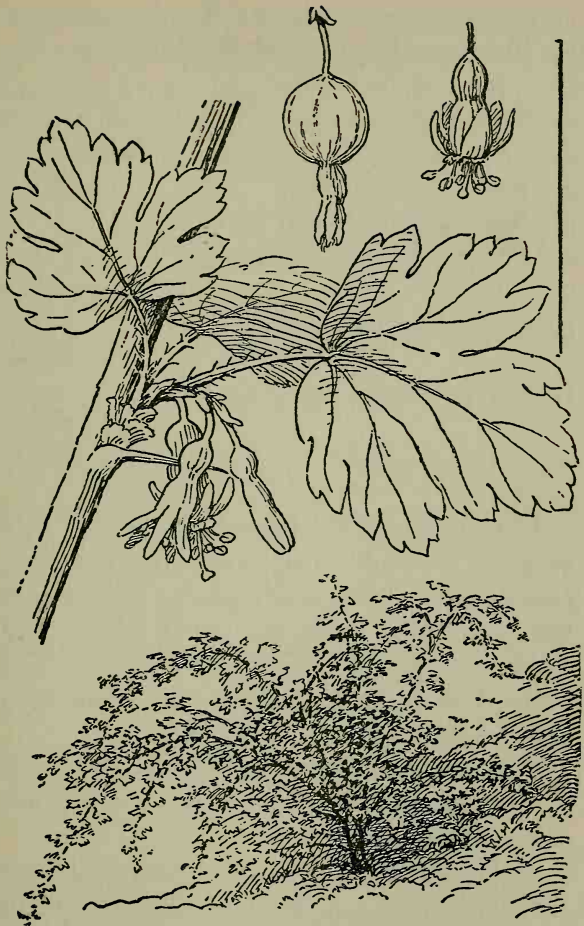


FIG. 50. Common wild gooseberry (*Ribes saxosum*)

c. Spines triple, long. 2. *R. saximontanum*
b. Flowers several in a cluster; calyx spreading. d.
d. Fruit red. 3. *R. lentum*
d. Fruit black. 4. *R. parvulum.*
e. Flowers not yellow. f.
f. Berry bristly-hairy; berry black. g.
g. Calyx tube saucer-shaped. 5. *R. coloradense*
g. Calyx tube bell-shaped. 6. *R. Wolfii*
f. Berry smooth; berry light red. 7. *R. cereum.*
e. Flowers yellow. 8. *R. longiflorum.*

1. Common Wild Gooseberry (*Ribes saxosum*). An undershrub with arching stems, common in moist, shady places all through the mountains from the upper plains into the lower edge of the sub-alpine zone. The berries are smooth, dark purple, when ripe, edible but very tart.

The stems are sometimes nearly or quite free from spines but are commonly somewhat prickly on some portion.

2. Rocky Mountain Gooseberry (*Ribes saximontanum*). A low, spreading shrub in moist shady places throughout the mountains of Colorado and Wyoming. The stout spines are often in threes or triple-pointed,

and the leaves are small and three-lobed. The berries are reddish-purple and smooth and are edible.

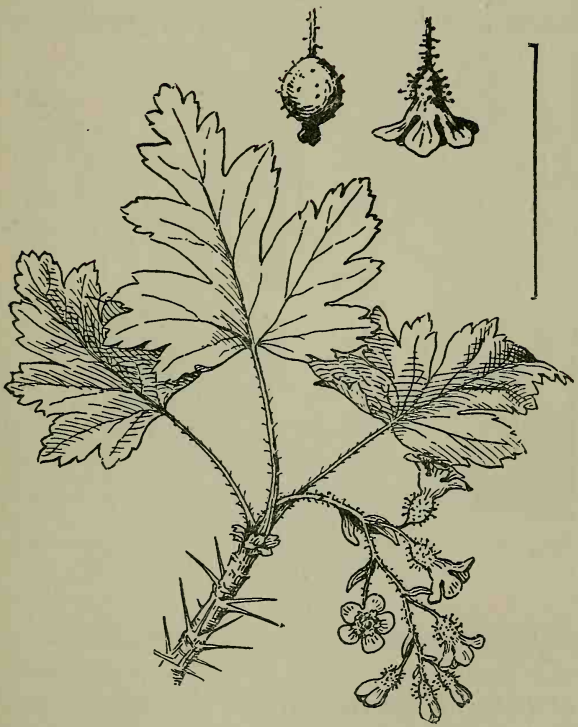


FIG. 51. Red-fruited gooseberry (*Ribes lentum*)

3. Red-fruited Gooseberry (*Ribes lentum*). A low shrub with arching prickly stems growing in canyons in the sub-alpine zone through-

out the mountains. The flowers are greenish or purplish white; fruit red, usually covered with short glandular hairs; edible.

4. Small-fruited Gooseberry (*Ribes parvulum*). A low, spreading shrub growing on

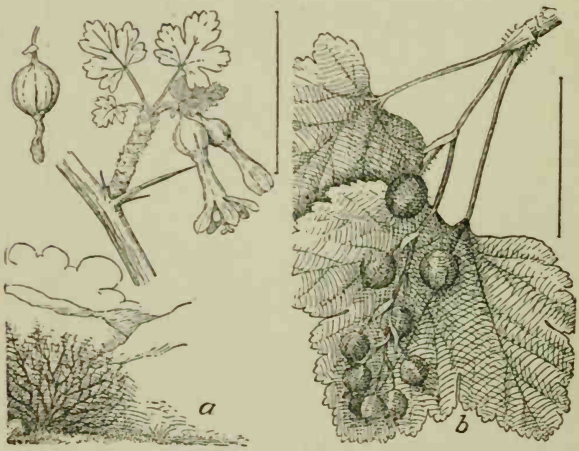


FIG. 52. (*a*) Small-fruited gooseberry (*Ribes parvulum*) (*b*) Wolf's gooseberry (*Ribes Wolfii*)

rather dry hillsides and timbered slopes of the mountains chiefly in the western parts of Colorado northward and westward. The berries are small, nearly black, when ripe, and are somewhat bristly.

5. Colorado Currant (*Ribes coloradense*). A spreading shrub with brown bark occurring in the mountains principally of western Col-

orado. Leaves broad; fruit black, with a bloom.

6. Wolf's Currant (*Ribes Wolfii*). This shrub occurs in canyons and moist woods

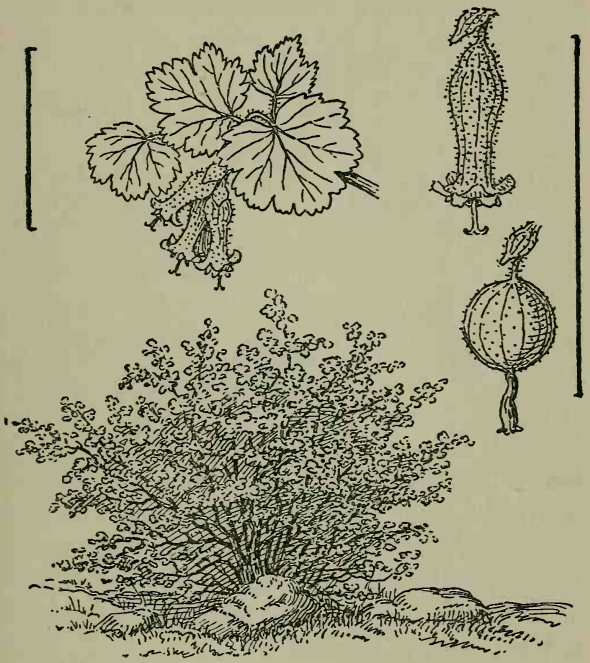


FIG. 53. Red or squaw currant (*Ribes cereum*)

in the higher altitudes throughout Colorado into Utah, New Mexico and Arizona. The leaves are large, rounded and rather thick. Fruit glandular, hairy when young, becoming smooth when ripe; black with a bloom.

7. Red Currant, Squaw Currant (*Ribes cereum*). This is one of our common shrubs on open hillsides from the upper plains to the sub-alpine zone all over the region. It is

FIG. 54. Golden currant (*Ribes longiflorum*)

easily recognized by its rather strongly scented foliage and its light red, insipid fruit.

Several forms of the species are recognized by botanists but they are not readily distinguishable by the layman. (*R. inebrians* is the form in Colorado.)

Golden or Missouri Currant (*Ribes longiflorum*). This common shrub, of rather erect habit, occurs among rocky outcrops on the plains and in the foothills all over the region. It is readily known by its wedge-shaped, mostly 3-lobed leaves, and especially by its

fragrant, golden yellow flowers with long tubular corollas.

The fruit is brownish or black and non-acid when fully ripe. A form with yellowish-red fruit of good flavor is found in rocky places on the plains, in the northeastern part of Colorado where it is gathered for domestic purposes.

HYDRANGEA FAMILY
(*Hydrangeaceæ*)

The plants of this family are shrubs or undershrubs with opposite, simple leaves in four ranks and showy white flowers.

Key

a. Leaves with toothed margins.
1. *Jamesia* (*Edwinia*)

a. Leaves with entire margins. b.

b. Flowers with more than ten stamens.
2. *Mock Orange*

b. Flowers with 10 stamens, or fewer.
3. *Fendlera*

1. Jamesia, Edwinia (*Jamesia americana*). A somewhat spreading, freely branched shrub of canyon walls and rocky slopes in the foothills and montane zones where it forms one of our common showy shrubs.

Although of rather slow growth it is a suitable shrub for ornamental planting under cultivation.

2. Western Mock Orange, Syringa (*Phil-*

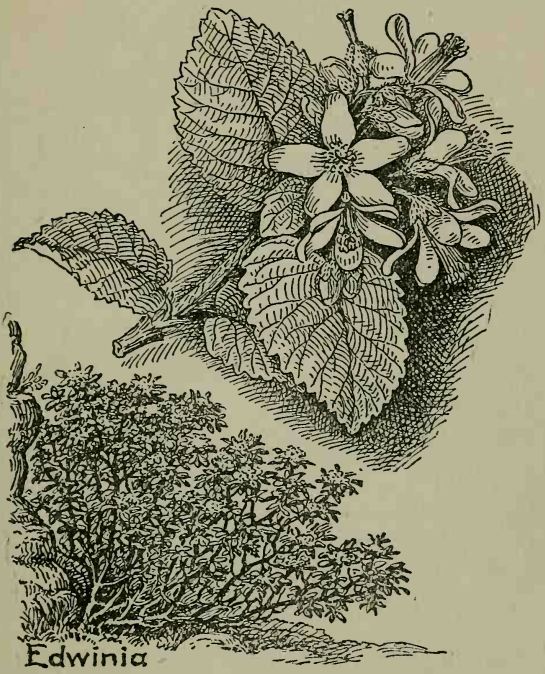


FIG. 55. Jamesia (*Jamesia americana*)

adelphus occidentalis). This is a stiffly-branched shrub of dry, rocky slopes and canyons in the foothills of southwestern Colorado and beyond into Utah.

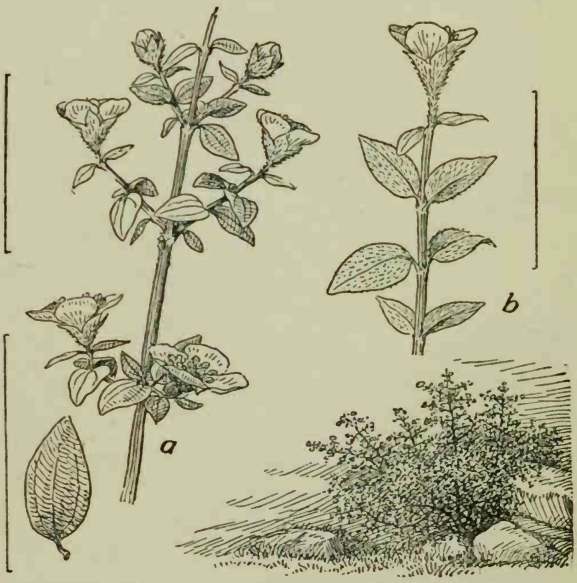


FIG. 56. (*a*) Shiny-leaved mock orange (*Philadelphus nitidus*). (*b*) Western mock orange (*Philadelphus occidentalis*)

Two other species (*P. nitidus* and *P. microphyllus*) occur in the same region. They differ from the first species in having leaves that are smooth and shining on the upper

surface. (*P. microphyllus* is the common species in Colorado.)

3. Fendlera (*Fendlera rupicola*). An erect shrub with similar appearance and habit of

FIG. 57. Fendlera (*Fendlera rupicola*)

growth to that of the mock oranges. Its leaves are long and narrow and the flowers are white tinted with pink. It occurs in the foothills of the southwestern part of Colorado and in New Mexico and Arizona where it is a somewhat common shrub among pinyons and cedars.

THE ROSE FAMILY
(*Rosaceæ*)

This large and important family is represented in our region by nearly thirty genera of which eleven contain shrubs. The leaves are alternate on the stem, simple or compound and possess stipules. The flowers are perfect and often large and showy. The fruits are mostly small and seedlike or in some species, berry-like.

Key

a. Leaves simple. b.
b. Fruits dry and seedlike, with feathery tails. c.
c. Leaves toothed; fruits single.
1. *Mountain Mahogany*
c. Leaves deeply lobed; fruits several to many. d.
d. Leaves with glandular dots; fruits 5.
2. *Cliff Rose*
d. Leaves without glandular dots; fruits many. 3. *Fallugia*
b. Fruits various, without feathery tails. e.

e. Leaves opposite; stems spiny.
4. *Coleogyne*
e. Leaves alternate; stems not spiny. f.
f. Leaves bunched at end of twigs, 3-toothed, small. 5. *Antelope brush*
f. Leaves mostly scattered along the twigs, not 3-toothed. g.
g. Leaves white woolly beneath, merely toothed. 6. *False Meadowsweet*
g. Leaves not white woolly beneath, more or less lobed. h.
h. Flowers large; fruit berry-like.
7. *False Raspberry*
h. Flowers small; fruit not berry-like.
8. *Ninebark*
a. Leaves compound. i.
i. Stems without prickles; flowers yellow.
9. *Shrubby Cinquefoil*
i. Stems more or less prickly; flowers white or pink. k.
k. Leaflets large, usually 3; fruit edible.
10. *Wild Red Raspberry*
k. Leaflets smaller, 5 or more; fruit non-edible. 11. *Wild Roses*

1. Mountain Mahogany (*Cercocarpus parvifolius*). This is a very common shrub of medium height, growing on hillsides and rocky slopes chiefly among the foothills. The small wedge-shaped leaves are somewhat

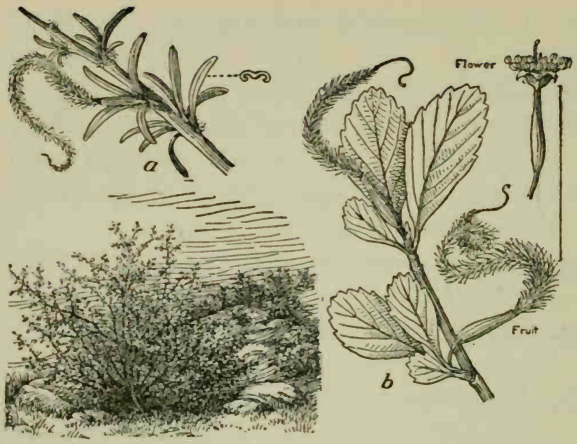


FIG. 58. Mountain mahogany. (*a*) (*Cercocarpus intricatus*). (*b*) (*Cercocarpus parvifolius*)

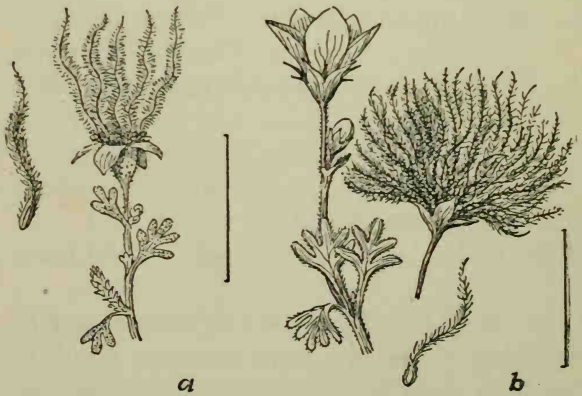


FIG. 59. (*a*) Cliff rose (*Cowania mexicana*). (*b*) Fallugia (*Fallugia intricatus*)

evergreen. The larger stems possess hard, dark-colored heartwood, whence the name, Mountain Mahogany. Another species (*Cercocarpus intricatus*) of low, densely branching habit, and with very narrow or linear leaves

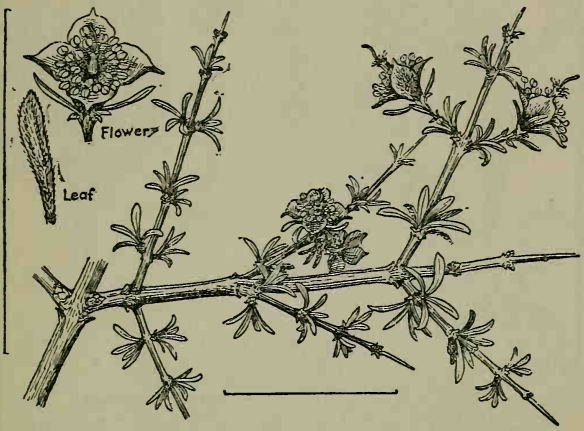


FIG. 60. Coleogyne (*Coleogyne ramosissima*)

occurs in Wyoming, southern Colorado, Utah and Nevada. It has the same, feathery-tailed fruit as the first species.

2. Cliff Rose (*Cowania mexicana*). A freely branched shrub 1 to 3 feet tall growing in rocky places from northern Utah into southern Colorado and beyond into Mexico. The light colored, shreddy bark, the small deeply lobed leaves with glandular dots, the yellow flowers followed by clusters of

feathery-tailed fruits, usually 5 in number, make this shrub rather easy to recognize.

3. Fallugia (*Fallugia paradoxa*). This is a very low, erect branched shrub similar in

FIG. 61. Antelope brush (*Purshia tridentata*). Flowering branch natural size; leaf and flower twice natural size

range, habit of growth and appearance to the cliff rose but differs in having leaves without glandular dots; white flowers and clusters of numerous feathery-tailed fruits.

4. Coleogyne (*Coleogyne ramosissima*). A

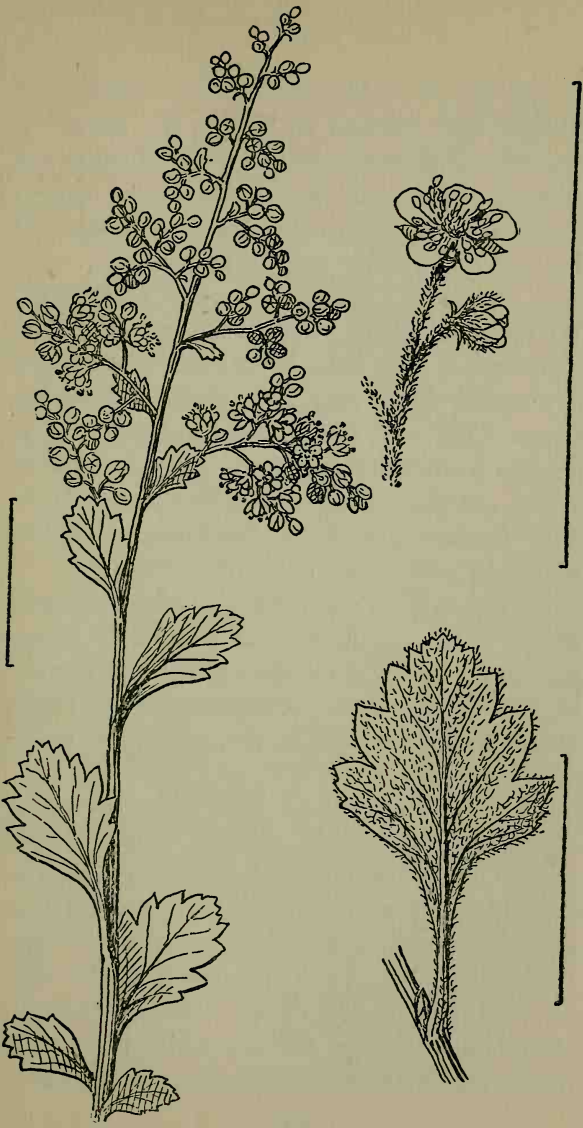


FIG. 62. False meadowsweet (*Holodiscus dumosus*)

desert shrub similar to the two preceding species but differing in having the branches opposite and spiny-tipped. The flowers are yellow, showy and are followed by single, seedlike fruits with curved tip and attached twisted style, hairy only at the base.

5. Antelope Brush (*Purshia tridentata*). Within our range this shrub grows in the form of a low densely branched bush on dry rocky slopes and open places chiefly between 7,000 and 9,000 feet elevation. It is readily known by its small, clustered leaves which are three-toothed or lobed at the apex. The flowers are yellowish-white in color, about ½ inch broad and are fragrant.

6. False Meadowsweet (*Holodiscus dumosus*). A low shrub with slender erect stems and large terminal clusters of minute flowers of a whitish color. It occurs among rocks or at the foot of cliffs in the mountains up to 9,000 feet elevation.

7. False Raspberry, *Thimbleberry* (*Rubus deliciosus, Bossekia deliciosa*). This is one of our most common shrubs all through the foothills and mountains up to 10,000 feet altitude. It occurs among rocks on hillsides, but is especially frequent on the soil-covered sides of canyons where, with its abundance of large solitary white flowers, it forms one of our showiest shrubs in early

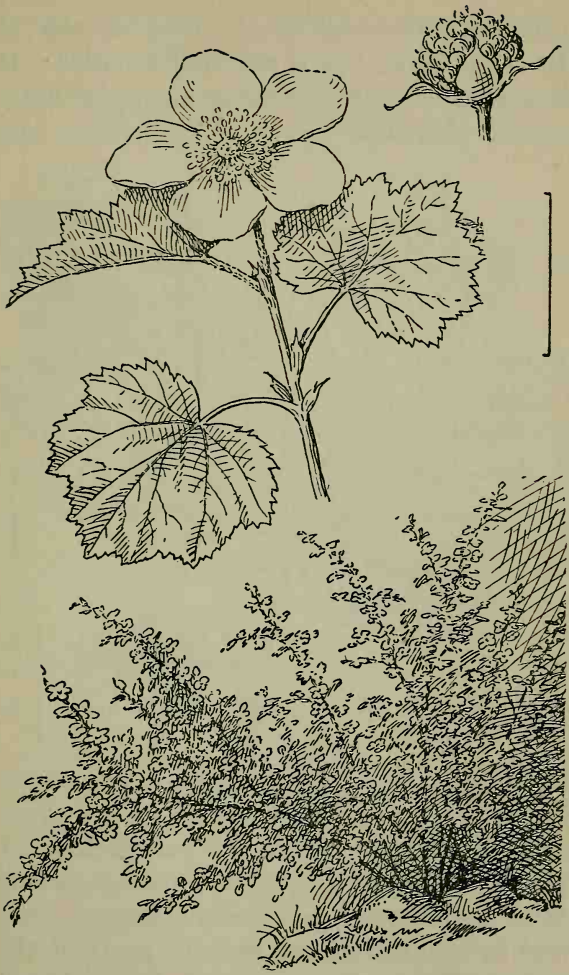


FIG. 63. False raspberry (*Rubus deliciosus*)

summer. The fruit closely resembles that of the raspberries but is not well flavored. It is sometimes sold by nurserymen for ornamental planting.

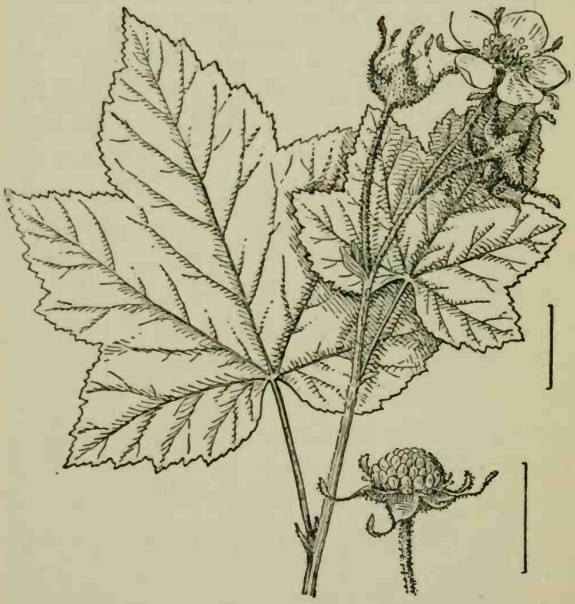


FIG. 64. Salmonberry (*Rubusparviflorus*)

The salmonberry (*Rubus parviflorus*). A shrub of medium height growing among trees and bushes principally along streams and in canyons in the western parts of the state. The leaves are 4 to 8 inches broad and its rather large white flowers are borne

in clusters of 3–6. The fruit is large, red and of good flavor.

8. Ninebark (*Physocarpus, Opulaster*). The ninebarks are shrubs of low to medium

FIG. 65. Ramaley's Ninebark (*Physocarpus Ramaleyi*)

height with toothed or lobed leaves and moderately small flowers in dense rounded clusters. The bark on older stems separates into thin shreddy layers from which feature the common name is derived. The fruit consists of from 1 to 5 small pods from each flower. Four species occur within our range.

Key

a. Leaves pubescent. (1) *P. pubescens*
a. Leaves glabrous. b.
b. Flower stalks with broad, often toothed bracts. (2) *P. Ramaleyi*
b. Flower stalks with small narrow entire bracts. c.
c. Low spreading shrub 12 to 30 inches tall; pods 1 or 2 and united. (3) *P. monogynus*
c. Upright shrub 3 to 5 feet tall; pods 3 to 5, separate except at the base. (4) *P. intermedius*

(1) The Pubescent-leaved Ninebark (*Physocarpus pubescens*), is recorded as occurring from Montana to Colorado and Utah. It is not very common.

(2) Ramaley's Ninebark (*Physocarpus Ramaleyi*), is chiefly found in canyons and gulches among the lower foothills in Colorado. It is a shrub of rather erect growth 3 to 6 feet high. It is a valuable ornamental shrub as it does not sucker from the root.

(3) Low Ninebark (*Physocarpus monogynus*). This low, spreading shrub is the most common of our ninebarks. It grows in rocky places in canyons and among the foot-

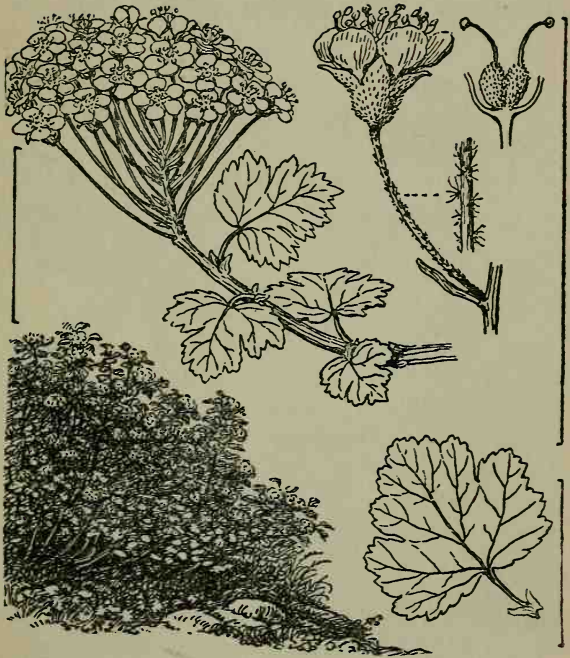


FIG. 66. Low Ninebark (*Physocarpus monogynus*)

hills and mountains up to 9,000 feet elevation. It grows much larger under cultivation than when wild, but suckers freely from the roots.

(4) Eastern Ninebark (*Physocarpus intermedius*). This species ranges from the

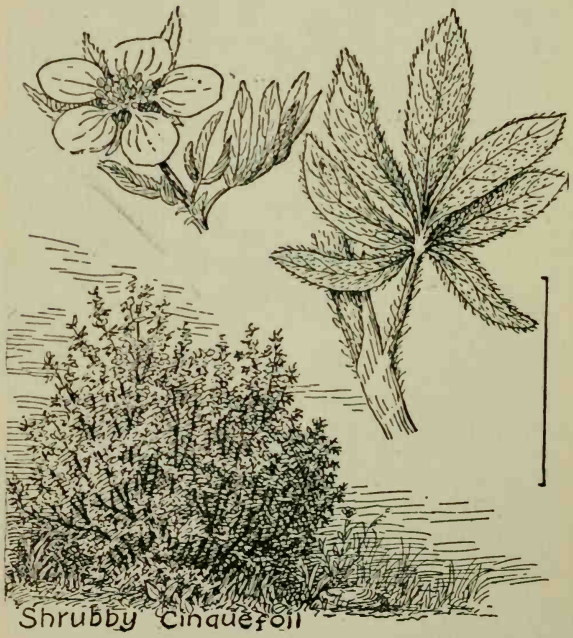


FIG. 67. Shrubby Cinquefoil (*Dasiophora fruticosa*)

Mississippi Valley to Central Colorado where it is recorded as growing near Colorado Springs and Boulder. It is a shrub 3 to 6 feet in height.

FIG. 68. Wild Red Raspberry (*Rubus strigosus*)

9. Shrubby Cinquefoil (*Dasiophora fruticosa*). This is one of our common and ornamental shrubs of the northern half of the continent. In our region it occurs chiefly in open ground along streams and in meadows and parks from 7,000 to 10,000 feet elevation. It is readily known by its palmately compound leaves with 5–7 hairy leaflets, the shreddy brown bark of its stems and the showy yellow flowers which are borne all through the summer. It is an ornamental shrub of easy growth under cultivation.

10. Wild Red Raspberry (*Rubus strigosus*). A common low shrub with prickly stems, large compound leaves and small-petaled white flowers followed by thimble-shaped berries composed of many small aggregated drupelets. It occurs all through the mountains among trees and in open burned-over areas up to 10,000 feet elevation. The fruit is of excellent flavor and is often picked for the table.

11. Wild Rose (*Rosa*). The wild rose is a familiar shrub to nearly everybody and, as a genus, hardly needs a description. The leaves are pinnately compound, with from 5 to 11 leaflets, and have large stipules joined to the base of the petiole. The stems are more or less prickly and in some species two stouter prickles than the others grow

just below the stipules at each node of the stem and are known as infrastipular spines (below the stipules). The large white or

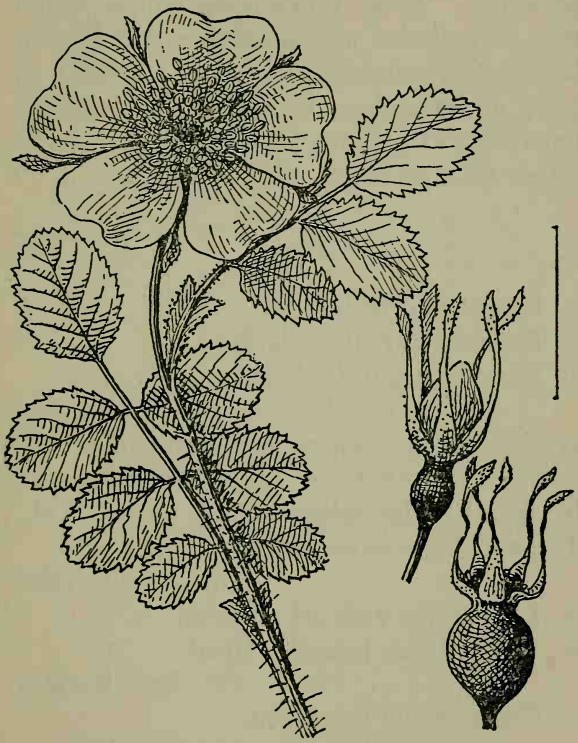


FIG. 69. Common Wild Rose (*Rosa Sayi*)

rose-colored flowers are followed by globular or pear-shaped red fruits known as hips which contain several bony seedlike fruits, the

styles of which project through the necklike upper part. The species are as difficult to separate as the genus as a whole is easy to recognize. Those which occur in our region may be included within six species. Due to their great variability and their tendency to cross or hybridize, the species, as here defined, should perhaps be considered as types rather than as clearly distinct species.

Key

a. Fruit not prickly. b.
b. Infrastipular spines lacking. c.
c. Flowers usually solitary; sepals erect (1) *Rosa Sayi*
c. Flowers in clusters; sepals spreading (2) *Rosa arkansana*
b. Infrastipular spines usually present. d.
d. Leaf stalks more or less prickly. (3) *Rosa Fendleri*
d. Leaf stalks without prickles. e.
e. Outer sepals laterally lobed. (4) *Rosa Woodsii*
e. Outer sepals not lobed. (5) *Rosa Nutkana*
a. Fruit prickly. (6) *Rosa MacDougalii*

(1) Common Wild Rose (*Rosa Sayi*). This is a low prickly-stemmed rose usually

one or two feet tall which grows in open woods and on hills all through the northern Rocky Mountains into central Colorado.

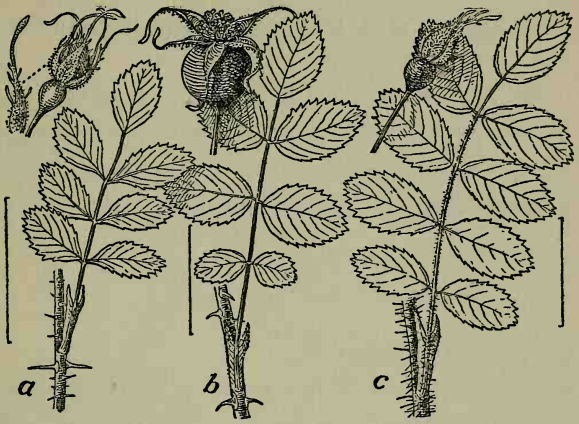


FIG. 70. Wild Roses. (*a*) *Rosa Woodsii.* (*b*) *Rosa Nutkana.* (*c*) *Rosa arkansana*

APPLE FAMILY (*Pomaceæ*)

The members of this family are all shrubs or trees with alternate, simple or compound leaves, showy flowers and fleshy fruit called a pome, such as that of the apple.

Key

a. Leaves simple. b.
b. Flowers and fruits solitary or few in a cluster. 1. *Peraphyllum*
b. Flowers and fruits several to many in a cluster. c.
c. Branches without thorns; seeds not bony. 2. *Shad, Service Berry*
c. Branches more or less thorny; seeds bony. 3. *Hawthorn*
a. Leaves compound. 4. *Mountain Ash*

1. Peraphyllum (*Peraphyllum ramosissimum*). This low, rigidly branched shrub is not uncommon on dry hills and slopes, often among cedars, in southern and western Colorado and westward and northward to

California and Oregon. Its fruits resemble small apples and it is sometimes called "wild apple" locally.

2. Shad, Service Berry (*Amelanchier*).

All of our species are shrubs with usually

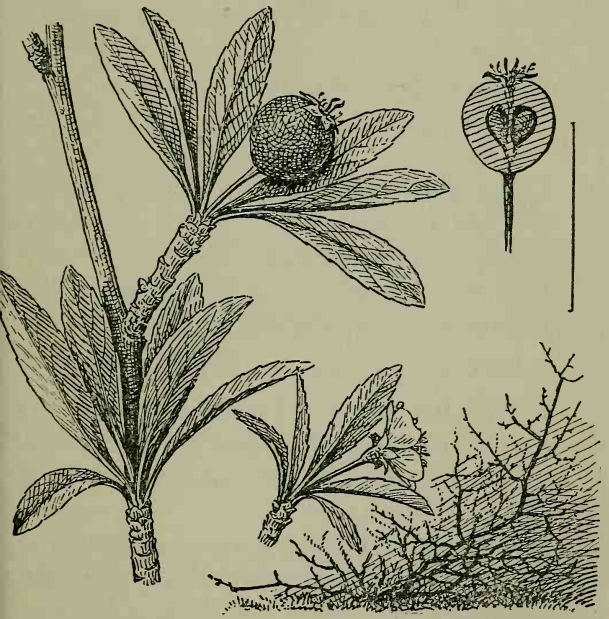


FIG. 71. Peraphyllum (*Peraphyllum ramosissimum*)

toothed leaves, showy white flowers in clusters and small, berry-like edible fruits. The species are separable with some difficulty.

Key

a. Leaves and twigs glabrous when mature. b.
b. Bud scales glabrous. (1) *A glabra*
b. Bud scales hairy. c.
c. Leaf blades elliptical. (2) *A. elliptica*
c. Leaf blades nearly circular to broadly oval. (3) *A. spicata*
a. Leaves pubescent on both sides. d.
d. Leaves sharply toothed around the apex. e.
e. Calyx and flower stems woolly; flower clusters dense. (4) *A. Bakeri*
e. Calyx and flower stems glabrous; flower clusters dense. (5) *A. oreophila*
d. Leaves entire or slightly toothed; flowers few. (6) *A. prunifolia*

(1) Smooth Shad (*Amelanchier glabra*). A stout shrub of southwestern Colorado and westward between 7,000 and 11,000 feet elevation.

(2) Oval-leaved Shad (*Amelanchier elliptica*). A slender treelike shrub in wet ground in the mountains of Colorado, Wyoming and Utah between 6,000 and 8,000 feet elevation.

(3) Common Shad (*Amelanchier spicata*). This is perhaps the most common of the shads in our region. It occurs on hills and

FIG. 72. Common Shad (*Amelanchier spicata*)

FIG. 73. Plum-leaved Shad (*Amelanchier prunifolia*)

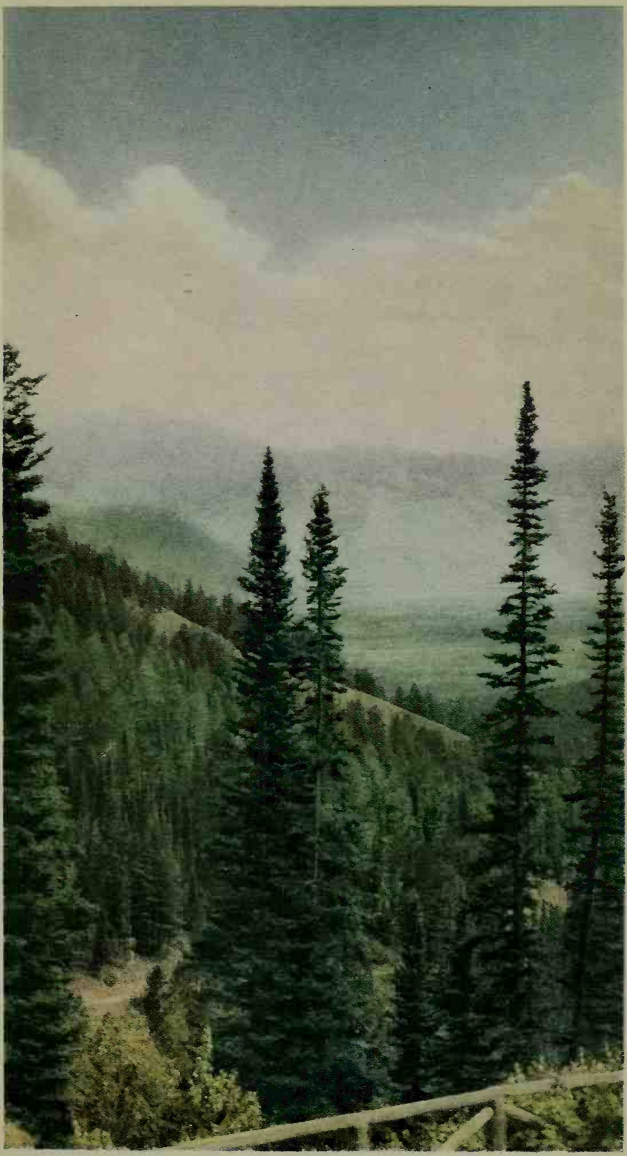
along streams up to 8,000 feet, and varies in habit from a low spreading shrub to a small tree 10 or 12 feet tall. The flowers are borne in dense clusters and are followed in late summer by purplish fruits of good quality in appearance like those of the blueberry. (*A. alnifolia*).

(4) Baker's Shad (*Amelanchier Bakeri*). A large shrub growing on dry hills of southern Colorado. The flowers are smaller than those of the preceding species.

(5) *Shad* (*Amelanchier oreophila*). This species occurs in Wyoming and western Colorado in rather low densely crowded clumps. The fruit is dry and insipid.

(6) Plum-leaved Shad (*Amelanchier prunifolia*). A bushy shrub of the dry mountains of western Colorado up to an elevation of 8,000 feet.

3. Hawthorn, Thorn Apple (*Cratægus*). The hawthorns are large shrubs or small trees with thorny branches, simple, toothed or lobed leaves, showy white flowers and pomelike fruits containing 2 to 5 bony-covered seeds. The number of species recognized is very large and they are difficult to separate by even the expert botanist. Six species come within the range of this work. Several of the species are suitable for ornamental planting.



VII. ALPINE FIR IN THE SUB-ALPINE ZONE

Near Jackson's Hole, Wyoming

Key

a. Teeth of leaves tipped with glands. b.
b. Leaves small, less than ¾ inch wide.
(1) *C. saligna*
b. Leaves large, usually more than 1 inch wide. c.
c. Leaves thin; petioles without glands.
(2) *C. cerronis*
c. Leaves thick; petioles with glands.
(3) *C. Doddsii*
a. Teeth of leaves without glands. d.
d. Twigs of the season glabrous; anthers pink. (4) *C. coloradensis*
d. Twigs of the season woolly or pubescent; anthers white. e.
e. Leaf blades 4 to 5 times as long as their petioles; fruit broader than long.
(5) *C. occidentalis*
e. Leaf blades 2 to 3 times as long as their petioles; fruit as long as or longer than broad. (6) *C. coloradoides*

(1) Small-leaved Hawthorn (*Cratægus saligna*). A tall shrub, or slender and tree-like, with long flexible branchlets armed with slender black thorns. This species grows in canyons of west-central Colorado up to elevations of 7,000 feet. It is easily recognized by its small narrow leaves and its black, globular fruits.

(2) Shiny-leaved Hawthorn (*Cratægus cerronis*). A small tree 6 to 18 feet tall with spreading crown, stiff branchlets, rough-

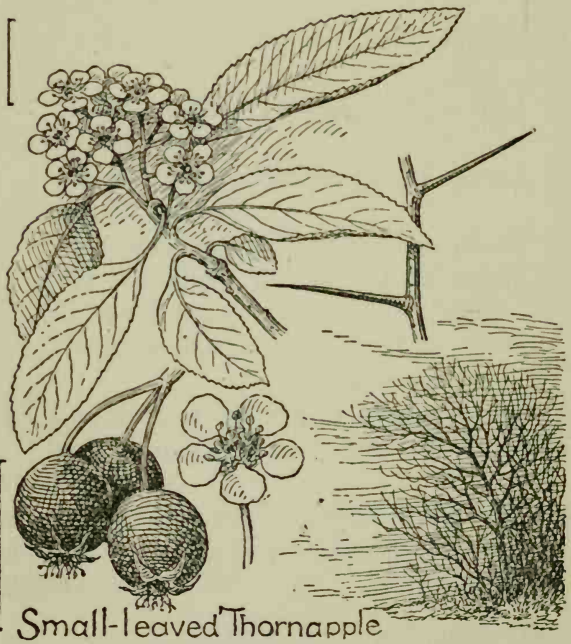


FIG. 74. Small-leaved Hawthorn (*Cratægus saligna*)

barked trunk and stout thorns. Leaves somewhat lobed or coarsely toothed, shiny above. Fruit brown or nearly black. Rather common in canyons and along streams in the mountains of Wyoming and Colorado up to 8,000 feet elevation.

(3) Thick-leaved Thornapple (*Cratægus Doddsii*). A shrub or small tree with dark, red fruit growing in canyons of Colorado.

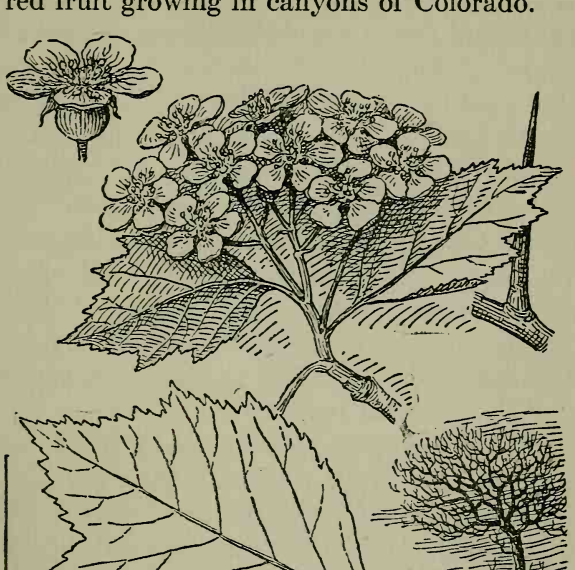


FIG. 75. Shiny-leaved Hawthorn (*Cratægus cerronis*)

(4) Colorado Thornapple (*Cratægus coloradensis*). A small tree 10 to 15 feet tall with spreading crown, woolly flower stalks and calyx and scarlet, edible fruit. It occurs in canyons of the eastern slope of the mountains in Colorado.

(5) Western Thornapple (*Cratægus occidentalis*). A tall shrub or sometimes a small tree up to 30 feet tall, growing along streams in North Dakota and Montana southward into Nebraska and Colorado. In Colorado it occurs in canyons of the eastern foothills up to 6,000 feet elevation. The thorns are slender; the leaves are short-stalked and the fruits are somewhat longer than broad.

(6) Canyon Hawthorn (*Cratægus coloradoides*). This hawthorn resembles the preceding species in habit and size but is limited to the state of Colorado. It differs from the western hawthorn in its longer leaf stalks and its spherical red fruits.

Two other species of hawthorn (*Cratægus laurentiana* and *C. rivularis*) have been recorded as occurring in Colorado but they are not common and are not easily separable from the foregoing species.

4. Mountain Ash. *Pyrus* (*Sorbus*). Western Mountain Ash (*Pyrus scopulina*) (*P. sambucifolia* in part.) This is a shrub 3–12 feet tall which occurs through the mountains of the northwest and southward as far as Colorado and Utah. Within our range it is found growing in canyons and moist sandy places up to 10,000 feet elevation. It is readily known by its compound leaves with 9 to 15 leaflets, which are 1¼ to 2½ inches

long, oblong-lanceolate, apex more or less abruptly tapering, sharply and often doubly serrate, glabrous on both sides, dark green above, paler beneath; its flat-topped clusters

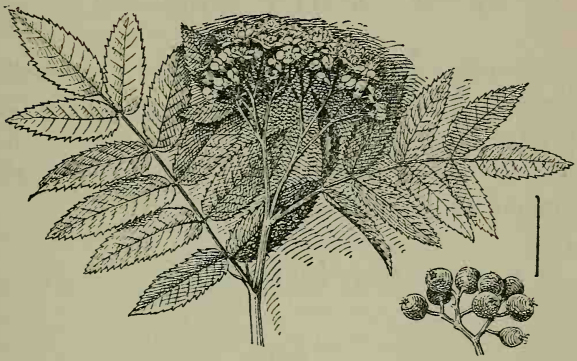


FIG. 76. Western Mountain Ash (*Pryus scopulina*)

of white flowers and its bright red berry-like fruits. By some authors this is regarded as the same as *P. sitchensis* of the northern Rocky Mountains. The leaflets of our form in the southern Rocky Mountains, however, are usually larger with coarser teeth and are more narrowly and gradually pointed than in that form.

PLUM FAMILY (*Drupaceæ*)

Shrubs or trees with simple leaves, showy flowers followed by fleshy or pulpy fruits which contain a single stone or pit within which one seed develops. Our species all belong to one genus.

PLUMS AND CHERRIES (*Prunus*)

Key

a. Flowers appearing before the leaves; branches thorny. 1. *P. americana*

a. Flowers appearing with or after the leaves; branches without thorns. b.

b. Flowers and fruits numerous, in elongated dense clusters borne at the ends of the twigs. 2. *P. melanocarpa*

b. Flowers few or several, in short clusters from the sides of the twigs. c.

c. Flowers more than 3 in a cluster; fruit about ¼ inch in diameter. 3. *P. pennsylvanica*

c. Flowers 1 to 3 in a cluster; fruit about ½ inch in diameter. 4. *P. Besseyi*

1. Wild Plum (*Prunus americana*). This is the common wild plum of the eastern half of the United States and the Rocky Mountains. It is often abundant along streams

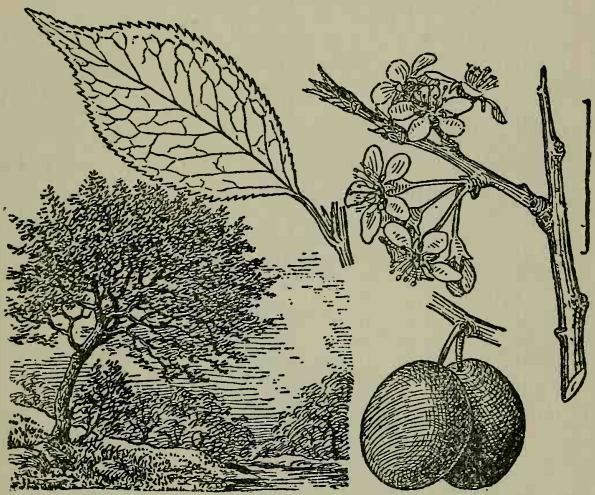


FIG. 77. Wild Plum. An old tree

and in the foothills where it frequently forms thickets or becomes a small tree, up to 15 feet in height. The fruit is ½ to ¾ inch long, yellow or red in color and of good flavor when ripe. It is locally gathered for jam and jelly. Several named varieties and hybrids are in cultivation.

2. Western Chokecherry (*Prunus melanocarpa*). A slender shrub or sometimes a small

tree up to 15 feet tall very common all through the central Rocky Mountains and northwestward. It usually occurs along streams and among rocks on hillsides. It

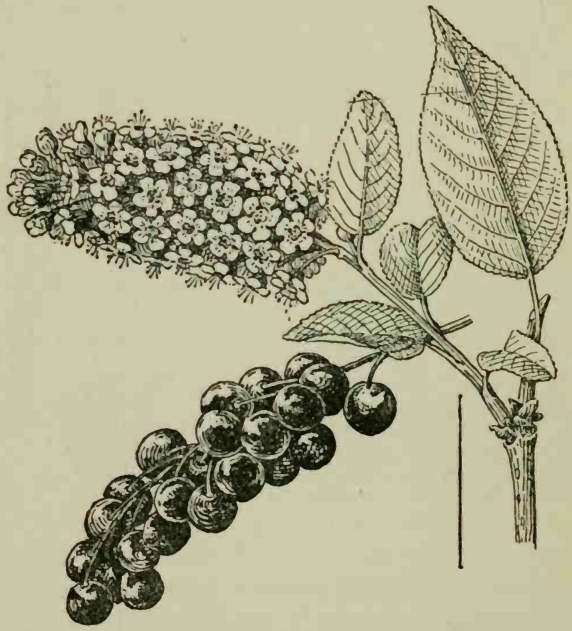


FIG. 78. Western Chokecherry (*Prunus melanocarpa*)

is readily known by its dense racemes of white flowers followed by crowded clusters of small cherries which are black when ripe. Its fruit is gathered locally for jams and jellies.

3. Bird Cherry, Pin Cherry (*Prunus pennsylvanica*). This cherry varies from a low

shrub among rocks at higher altitudes to a small slender tree in moist locations at lower elevations. From Colorado it extends eastward and northward to the Atlantic

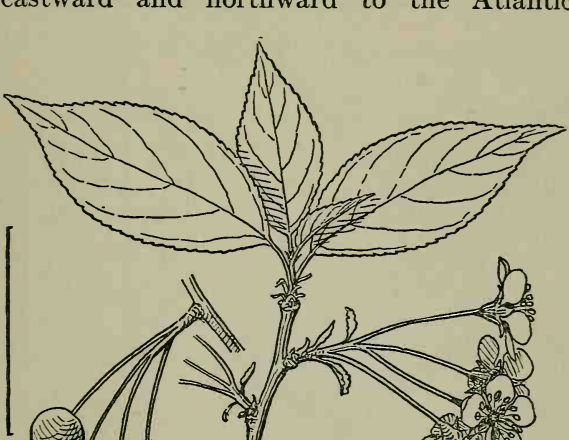


FIG. 79. Bird Cherry (*Prunus pennsylvanica*)

coast states. Its small red fruits are thin-fleshed and sour and are used but little.

4. Western Sand Cherry (*Prunus Besseyi*). This is a low, spreading shrub growing on hillsides over much of the western plains to the foothills of the Rocky Mountains. Its leaves are 1⅛ to 2¼ inches long, one third as wide, and are thick and shiny on the upper side. The fruits are ½ to ⅝ of an inch in diameter, nearly black when ripe, or some-

times yellowish red, and are valued for jellies. A number of named hybrids between the sand cherry and native species of plum have been produced and are in cultivation

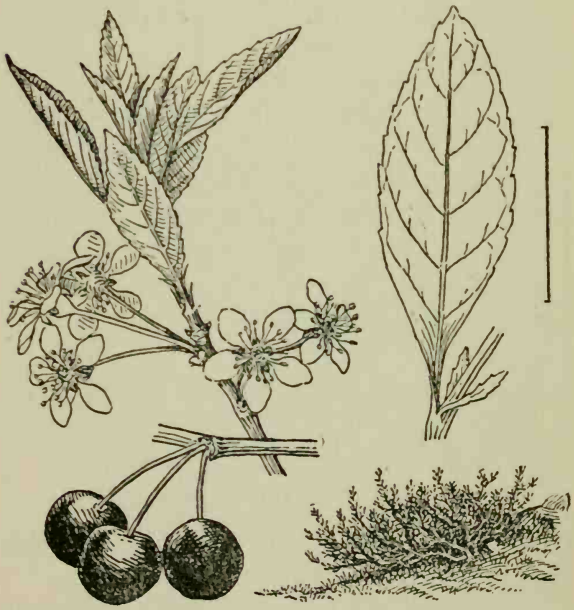


FIG. 80. Sand Cherry (*Prunus Besseyi*)

This species closely resembles the eastern sand cherry, *Prunus pumila*, from which it differs in having spreading instead of upright strict branches and in its thicker, shinier leaves.

PEA FAMILY (*Leguminoseæ*)

Herbs, shrubs, or trees with alternate, mostly compound leaves and irregular flowers, usually pea-shaped, followed by pods known as legumes. This large and important family is well represented in this region by nearly twenty genera and more than 200 species. The only ones which contain native woody plants are the following two:

1. Locust (*Robinia*)

New Mexican Locust (*Robinia neo-mexicana*). A coarse, prickly shrub or small tree growing along streams in the lower foothills of southern Colorado, in New Mexico and Arizona. The prickles arise in pairs and occupy the place of stipules. The flowers are large, pea-shaped and rose-colored and are followed by flat pods covered with stiff hairs.

This locust occurs as far north as Denver and is occasionally used for ornamental planting.

2. False Indigo, Lead Plant (*Amorpha*)

These are shrubs with glandular-dotted, compound leaves, small densely clustered

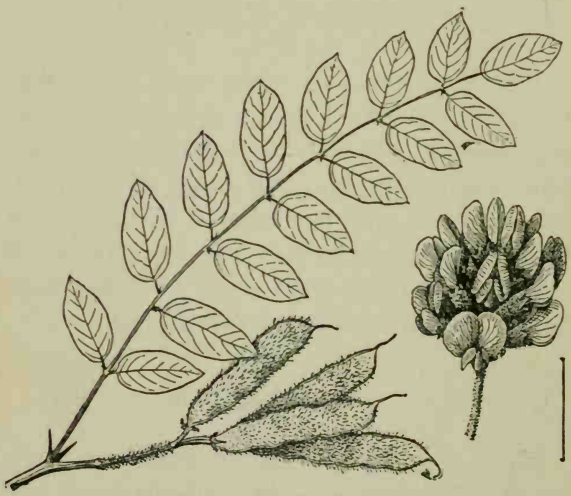


Fig. 81. New Mexican Locust (*Robinia neo-mexicana*)

purple flowers and small pods containing one or two seeds.

Key

a. Tall shrub, 3 to 8 feet tall; leaflets ¾ to 2 inches long. 1. *A. fruticosa*

a. Low shrubs, usually not above 3 feet; leaflets less than ¾ inch long. b.

b. Shrub 1 to 4 feet tall; densely hairy.
2. A. canescens

b. Shrub not over 1 foot tall; not densely hairy. *3. A. nana*

1. False Indigo (*Amorpha fruticosa*). A shrub of variable size and habit of growth,

FIG. 82. (*a*) False Indigo (*Amorpha fruticosa*); (*b*) Lead Plant (*Amorpha canescens*). (*c*) Fragrant False Indigo (*Amorpha nana*)

sometimes tree-like, with large uncrowded leaflets, 9 to 25 in number, and small purple flowers in dense spikes. It occurs along

streams in eastern Colorado and northeastward. It is sometimes planted as an ornamental shrub.

2. Lead-plant (*Amorpha canescens*). This species differs from the other two species of the genus chiefly in its very hairy stems and leaves. The latter have numerous narrow leaflets crowded upon their stalk. The flowers are small, purple and densely crowded. In our range this shrub occurs along the Platte river, and eastward.

3. Low or Fragrant False Indigo (*Amorpha nana*). This little shrub occurs near streams on the prairies of the northeast and is found on the plains close to the mountains in east central Colorado. The flowers are dark purple and fragrant.

BEAN CAPER OR CALTROP FAMILY
(*Zygophyllaceæ*)

This family is represented in our region by two genera one of which consists of shrubs.

FIG. 83. Creosote Bush (*Covillea tridentata*)

Creosote Bush (*Covillea tridentata*). This is a branchy strongly scented shrub 4 to 10 feet tall which grows on dry mesas from southern Colorado south to Texas and west to California. The yellowish green leaves are opposite, and composed of two small leaflets. The flowers are bright yellow and

the small dry fruit splits when ripe into five parts. The shrub takes its common name from the strong odor suggestive of creosote which all parts contain.

RUE FAMILY (*Rutaceæ*)

Shrubs or small trees with dotted, aromatic leaves, arranged alternately on the twigs.

Key

Leaves compound with 3 leaflets; shrub tall. 1. *Ptelea*

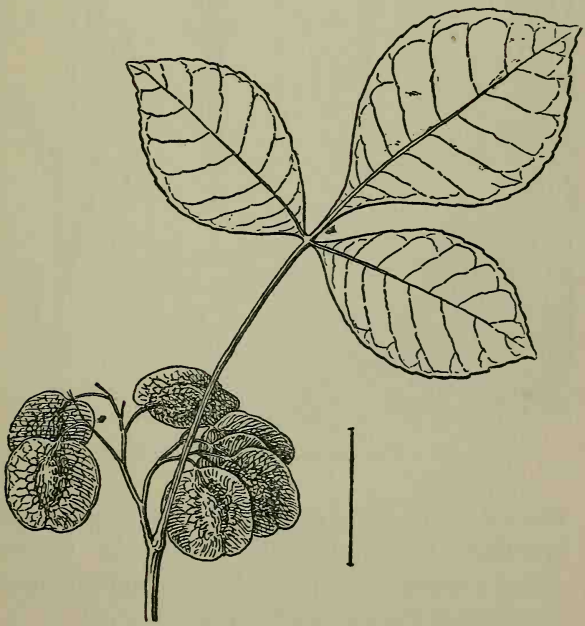


FIG. 84. Hop Tree (*Ptelea trifoliata*)

Leaves simple; low and woody only at base. 2. *Thamnosma*

1. Hop Tree (Wafer Ash) (*Ptelea crenulata*). A tall shrub or small tree up to 20

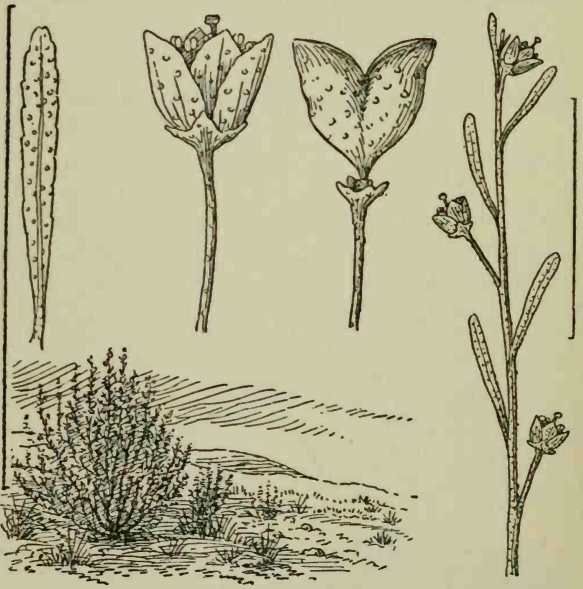


FIG. 85. Thamnosma (*Thamnosma texanum*)

feet tall with small greenish-white flowers and circular, wing-margined fruits. It occurs along streams from southern Colorado into Texas and west to California.

2. Thamnosma (*Thamnosma texanum*). A

low shrubby plant, woody only at the base, strongly scented and growing in arid ground from southwestern Colorado southward into New Mexico, Texas and Mexico. Its flowers are yellow tinged with purple.

SUMACH FAMILY (*Anacardiaceæ*)

Our species are all shrubs with alternate, compound leaves, small, imperfect flowers, and fruit a small drupe or stone fruit. Three species occur in our region and are included in the genus Rhus.

Key

a. Erect shrubs; leaflets 9 to 31.
1. *R. cismontana*

a. Low or spreading shrubs; leaflets. 3. b.

b. Stems freely branched, 2 to 5 feet tall; leaflets small; fruit red.
2. *R. trilobata*

b. Stems unbranched, less than 3 feet tall; leaflets large; fruit white.
3. *R. Rydbergii*

1. Rocky Mountain Sumach (*Rhus cismontana*). A shrub 3 to 7 feet tall growing on hillsides and in canyons throughout our region. The leaves turn scarlet or orange in fall which together with its deep red fruit masses make this one of our most attractive autumn shrubs. It is occasionally planted as an ornamental shrub but suckers quite freely.

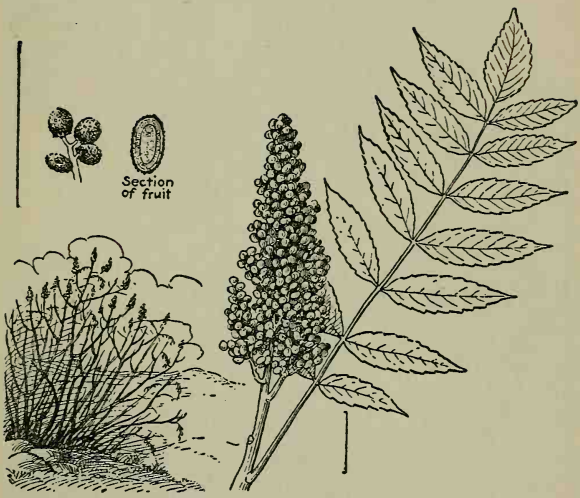


FIG. 86. Rocky Mountain Sumach (*Rhus cismontana*)

2. Three-leaf Sumach, Squaw bush, Skunk brush (*Rhus trilobata*). A shrub of spreading habit common on rocky hillsides all through our region up to 8,000 feet elevation. All parts of the plant emit a strong,

FIG. 87. Three-leaf Sumach (*Rhus trilobata*)

unpleasant odor when bruised. The foliage becomes quite brilliantly colored in autumn.

3. Western Poison Ivy (*Rhus Rydbergii*). A not uncommon low shrub along streams

and among rocks and trees in the foothills through the Rocky Mountains into Colorado. It closely resembles the eastern poison ivy (*Rhus toxicodendron*) and is considered by

FIG. 88. Western Poison Ivy (*Rhus Rydbergii*)

some botanists to be a non-climbing form of that species. It bears the same bad reputation as a poisonous plant when touched and should be carefully avoided by all who are susceptible to poisoning by the eastern species.

STAFF-TREE FAMILY (*Celastraceæ*)

This family is represented in our region by one species (*Pachystima myrsinites*), a low

FIG. 89. Pachystima (*Pachystima myrsinites*)

trailing evergreen shrub growing among woods in the mountains up to 10,000 feet elevation. It occurs all through the Rocky Mountains from British Columbia southward to New Mexico and westward to California.

MAPLE FAMILY (*Aceraceæ*)

Shrubs or trees with opposite, simple or compound leaves and double, winged, seed-like fruits.

THE MAPLES (*Acer*)

a. Leaves simple. b.
b. A tall shrub, rarely a small tree; fruit wings broad. 1. *A. glabrum*
b. Often treelike; fruit wings narrow. 2. *A. grandidentatum*
a. Leaves compound. 3. *A. negundo*

1. Rocky Mountain Maple, Smooth Maple (*Acer glabrum*). This little maple is common along streams and in moist places among the mountains of our region, also westward to the coast where it becomes a tree. Its leaves are sharply 3-lobed or rarely 3-parted or even divided, and become attractively colored in autumn. It is adapted to planting as a large ornamental shrub.

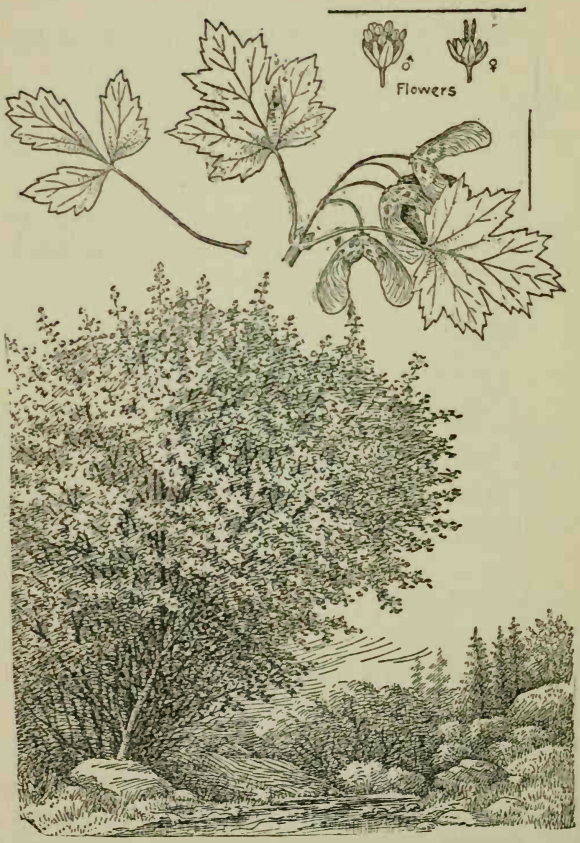


FIG. 90. Rocky Mountain Maple (*Acer glabrum*)

2. Large-tooth Maple (*Acer grandidentatum*). This maple is uncommon in our region but occurs along streams in central Colorado (Pike's Peak), Utah and north-

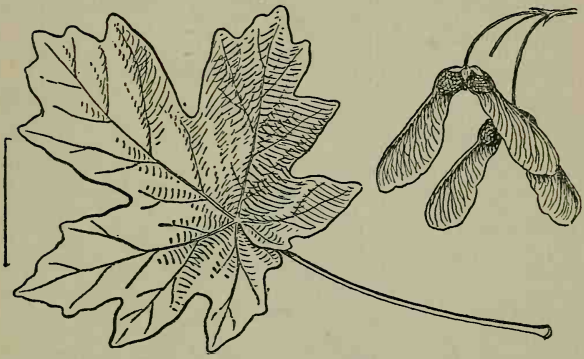


FIG. 91. Large-tooth Maple (*Acer grandidentatum*)

ward through Wyoming. It differs from the smooth maple in its larger size, and in the rounded notches of the leaves.

3. Box Elder (*Acer negundo*). A rather common tree of spreading form growing along streams in the plains and in the foothills up to 8,500 feet. The twigs are light green, covered with a bloom and possess a characteristic odor when bruised. The flowers are staminate and pistillate borne on separate trees, and the double, winged fruits are produced in elongated clusters.

The box elder is quite frequently planted

as a shade tree on the plains and becomes a moderately large tree under cultivation.

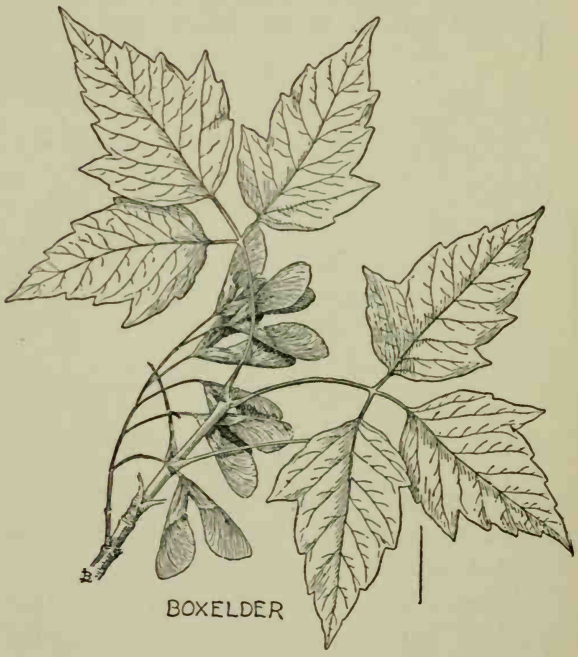


FIG. 92. Box Elder (*Acer negundo*)

The sap, while not so sweet as that of the eastern sugar maple, is capable of being used for sugar making.

SOAPBERRY FAMILY (*Sapindaceæ*)

Shrubs or trees with alternate, compound leaves without stipules, small 3 to 5-lobed or

FIG. 93. Wild China Berry (*Sapindus Drummondii*)

parted flowers, stamens and pistils in separate flowers, and fruit a berry (in ours),

with soapy flesh. One genus, Sapindus, is represented in our region.

Drummond's Soapberry, Wild China Berry, Indian Soaptree (*Sapindus Drummondii*). A tree up to 50 feet tall with grooved bark; leaves odd-pinnately compound with 7 to 19 leaflets; small white flowers and globular or oval translucent yellowish berries with 1 to 3 black seeds. The common name is derived from the soapy quality of the berries which have been employed as a substitute for soap.

It grows along streams and in canyons among hills coming into our region from the southeast and reaching southeastern Colorado in Furnace Canyon, Baca County.

BUCKTHORN FAMILY (*Rhamnaceæ*)

Shrubs or small trees with simple alternate or opposite leaves, small 4 to 5 parted flowers and berry-like or dry fruits.

Key

Stout shrubs; fruit berry-like. 1. *Rhamnus*
Low spreading shrubs; fruit dry.
2. *Ceanothus*

1. Buckthorn (*Rhamnus Smithii*)

This shrub bears some resemblance to the chokecherry. The leaves, however, are nearly opposite on the twigs and are glossy on the upper surface. The small greenish flowers are usually solitary in the axil of the leaves and are followed by black berry-like fruits containing two nut-like seeds. It is of infrequent occurrence, along streams from northwestern Colorado, (between Craig and Meeker), southward into New Mexico.

2. New Jersey Tea (*Ceanothus*)

Key

a. Spiny shrubs. 1. *C. Fendleri*
a. Spineless shrubs. b.
b. Leaves small, pubescent, deciduous. 2. *C. mollisimus*
b. Leaves large, shiny, evergreen. 3. *C. velutinus*

1. Fendler's New Jersey Tea (*Ceanothus Fendleri*). A low spiny bush common on hillsides and mountain slopes up to 9,000 feet elevation from Wyoming to New Mexico and Arizona. The leaves are ½ to 1 inch long, narrowed toward the base and pubescent underneath. The small white flowers are in simple, terminal clusters.

2. Hairy New Jersey Tea (*Ceanothus mollisimus*). This little shrub resembles the preceding species in habit of growth but is without spines, the twigs are dingy gray and pubescent or somewhat woolly and the flowers are borne in the axils of the leaves as well as in terminal clusters. Its range is in Colorado and Wyoming.

3. Mountain Balm (*Ceanothus velutinus*). This is a rather common hillside shrub of spreading habit, often forming extensive patches, in open places among trees through

FIG. 94. Buckthorn (*Rhamnus Smithii*)

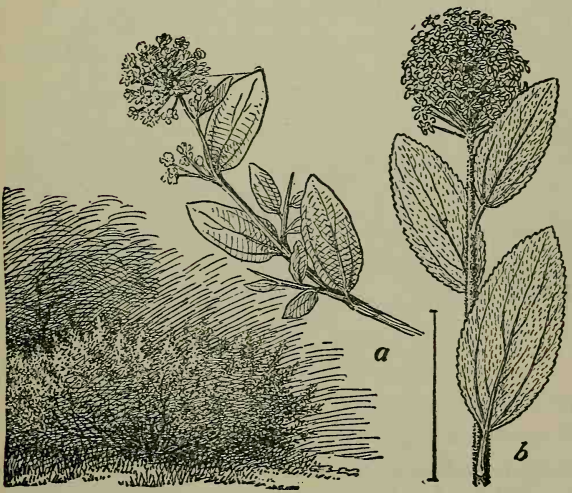


FIG. 95. New Jersey Tea. (*a*) (*Ceanothus Fendleri*) (*b*) (*Ceanothus mollisimus*)

the montane zone up to 9,000 feet elevation. It is easily known by its large shiny leaves, which remain green over winter, and by its

FIG. 96. Mountain Balm (*Ceanothus velutinus*)

profusion of minute sweet-scented, white flowers in densely branched clusters. Its range is from Central Colorado northward to British Columbia and westward to California.

GRAPE FAMILY (*Vitaceæ*)

Ours are slender woody vines climbing by means of coiling tendrils; flowers small, greenish; fruit a bluish-black berry.

Key

Leaves simple.	1. *Vitis*
Leaves compound.	2. *Parthenocissus*

1. Riverbank Grape, Wild Grape (*Vitis vulpina*). A somewhat common climbing

Fig. 97. Wild Grape (*Vitis vulpina*)

vine among bushes and trees along streams in eastern Wyoming and Colorado and eastward to the Atlantic region. The fruit is

often gathered for jellies after the early autumn frosts.

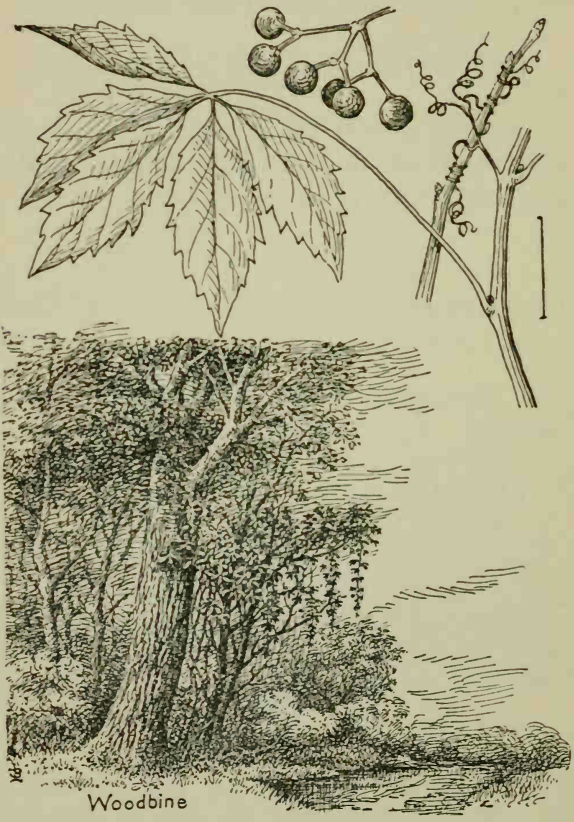


FIG. 98. Woodbine (*Parthenocissus vitacea*)

2. Virginia Creeper, American Ivy (*Parthenocissus vitacea*). This is our most com-

mon woody climber among bushes and trees near streams along the eastern side of the mountains from Wyoming southward through Colorado, southward and eastward. It is readily known by its palmately compound leaves with 5 leaflets. It is very commonly used for covering arbors and lattices. Its leaves become brilliant red or scarlet in autumn.

CACTUS FAMILY (*Cactaceæ*)

Green, fleshy or occasionally somewhat woody-stemmed plants usually armed with clustered spines. The stems differ much in shape, being globular, columnar, cylindrical or flattened and jointed and are, in some species, ribbed or covered with small knobs or tubercles. Most of them are leafless plants, the green stems taking the place of leaves. The flowers are often very showy and consist of numerous sepals, petals and stamens. The fruit is usually pulpy and filled with numerous seeds, and may be either smooth, scaly, or prickly.

The plants of this peculiar family are able to resist the dry hot air of the desert and are common in the arid portions of the United States. The species which occur in this region are grouped into four genera which differ greatly in size, shape and structure. Only two of our species merit the name of shrub, the others being fleshy-stemmed perennials.

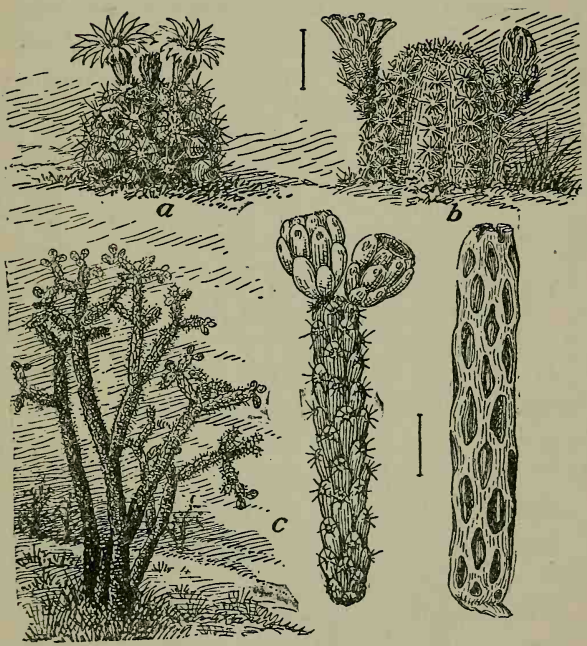


FIG. 99. Forms of cacti. (*a*) Purple Ball Cactus (*Mamillaria vivipara*). (*b*) Hedgehog Cereus (*Echinocereus viridiflorus*). (*c*) Cane Cactus (*Opuntia arborescens*) Fruiting branch and joint with pulp removed

Key

a. Stems globular or egg-shaped, not jointed; leafless; spines without barbs. b.

b. Flowers arising from between the tubercles; ovary naked. 1. *Mamillaria*

b. Flowers arising from the tubercles or ribs; ovary scaly. c.

c. Flowers nearly terminal. 2. *Echinocactus*

c. Flowers lateral on the stems. 3. *Echinocereus*

a. Stems, consisting of flattened or cylindrical joints; leaves small, falling early; spines minutely barbed. 4. *Opuntia*

1. Ball or Pin Cushion Cactus (*Mamillaria*). Small globose plants with yellow,

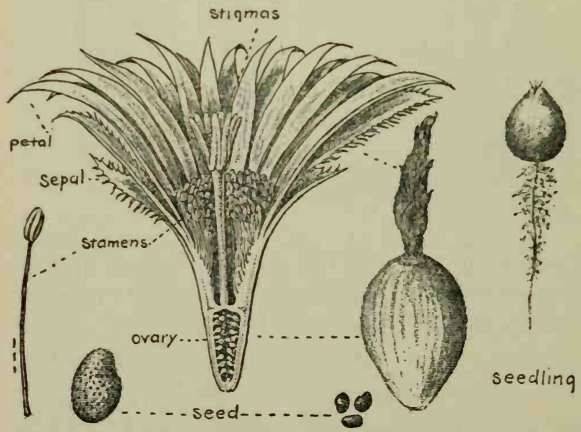


FIG. 100. Flower, fruit and seed of Purple Ball Cactus (*Mamillaria vivipara*) Enlarged

red or purple flowers which appear from near the center of the stem in spring. Four spe-

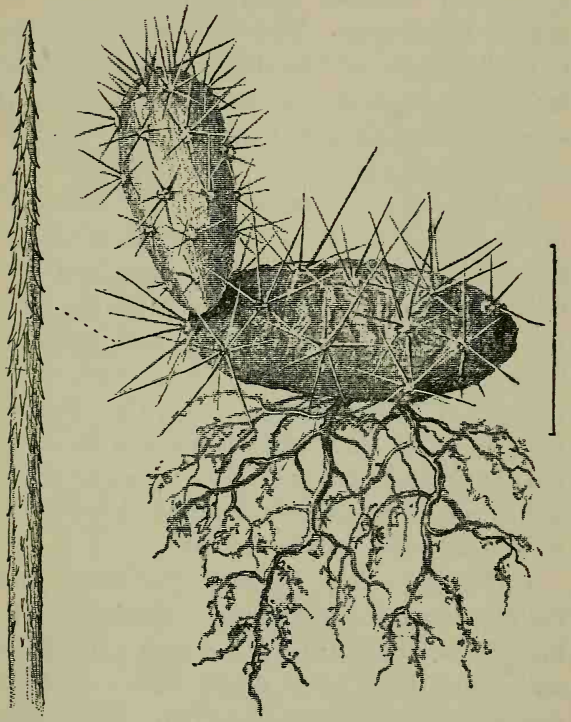


FIG. 101. Rooted joints of stem of Brittle Prickly Pear Cactus (*Opuntia fragilis*). Barbed prickle

cies distributed quite generally over our region are to be found.

2. Hedgehog-thistle Cactus (*Echinocactus*). These are somewhat larger plants

than the preceding and vary from globular or cushion-shaped to short cylindric. They are either covered with tubercles or are ridged lengthwise. The flowers arise from near the center of the stems and are yellowish-green, rose-colored or purplish. Three species occur in this region, chiefly in the southwestern part.

3. Cereus (*Echinocereus*). The stems of these plants resemble in shape those of the first two genera but are definitely ridged and bear the flowers below the center or upon the sides. In some species the stem is branched so as to form dense clusters or masses of considerable size. The flowers vary in color from yellowish-green to crimson and deep purple. Five species occur in our region principally from southern Colorado southward and westward.

4. Prickly Pear (*Opuntia*). These are readily recognized by their jointed, branching stems which are flattened or cylindrical and which bear small fleshy leaves of short duration upon the newer growth. The spines are clustered and usually of two kinds; long and stout ones with clusters of numerous small ones at their base. All of the spines are barbed and are therefore difficult to remove when lodged in the skin of a person. In some species their distribution is readily

effected by means of the separated joints of stem becoming attached by the spines to

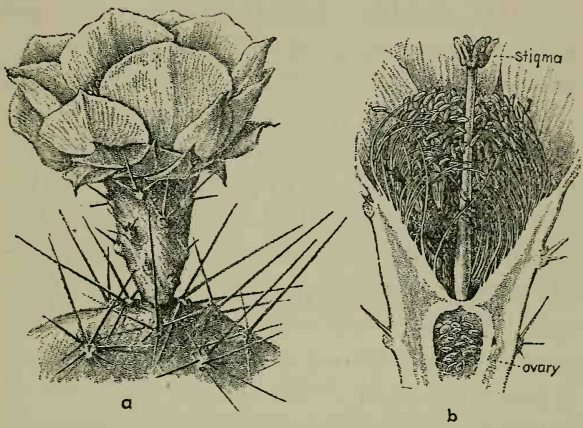


FIG. 102. Flower of a prickly pear cactus (*Opuntia polyacantha*) and section

the legs or muzzle of grazing animals. The large, showy flowers vary from yellow to

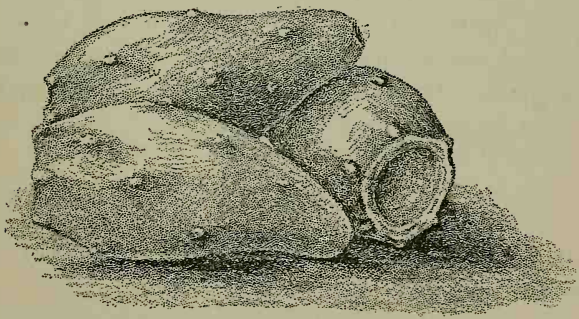


FIG. 103. Fruit of a prickly pear without spines (*Opuntia humifusa*)

red and purple. The fruit is often somewhat pear-shaped and covered with tufts of the smaller prickles. Eleven species are recorded for our region of which two are woody-stemmed and regarded as true shrubs.

Tree Cactus, Cane Cactus (*Opuntia arborescens*). An erect, somewhat raggedly branched cactus 3 to 15 feet tall growing on the plains and on hillsides from central Colorado to Texas and Arizona. The stems are sometimes freed from bark and pith and used for souvenir canes. With its large purple flowers 2 to 3 inches across the plant is beautiful when in full bloom. It occurs as far north as Colorado Springs and has occasionally been employed as an ornamental shrub in dry places.

Davis Prickly Pear (*Opuntia Davisii*). This differs from the preceding species in its low spreading stems, 1 to 2 feet tall which are densely branched, and in its yellowish flowers. It extends from Texas northward into southwestern Colorado.

OLEASTER FAMILY (*Elæagnaceæ*)

Shrubs or trees with scurfy twigs and foliage due to the presence of minute silvery or brownish scales. The small flowers are either perfect, or stamens and pistils in separate flowers with 4-parted calyx border. The fruit is a small drupe or stone fruit.

Key

Leaves alternate; fruits silvery. 1. *Elæagnus*
Leaves opposite; fruit red or yellowish.
2. *Shepherdia*

1. Silverberry (*Elæagnus argentea*). A shrub 3 to 10 feet tall with oval leaves, perfect flowers with 4 stamens and small silvery drupes. Moist ground from Utah through Wyoming north eastward.

2. The Buffalo Berries (*Shepherdia*).

Key

Tall shrub or small tree; thorny.
(1) *S. argentea*
Low to medium shrub; thornless.
(2) *S. canadensis*

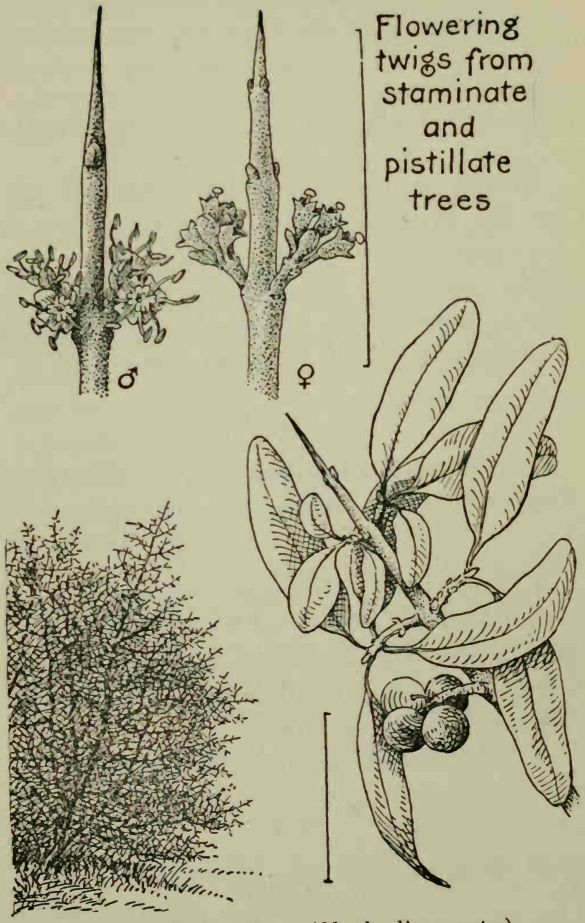


FIG. 104. Buffalo Berry (*Shepherdia argentea*)

(1) Buffalo Berry (*Shepherdia argentea*). This is a common tall thicket-forming shrub or sometimes a small tree 10 to 15 feet tall

FIG. 105. Canada Buffalo Berry (*Shepherdia canadensis*)

growing along streams from the plains into the foothills up to 7,000 elevation throughout the region. Staminate and pistillate flowers are borne on different plants; the bright red fruit is edible but tart and is some-

times used for jellies. This shrub grows well under cultivation although somewhat inclined to sucker from the roots.

(2) Canada Buffalo Berry (*Shepherdia canadensis*). A lower, more spreading shrub than the preceding species, with brownish-scurfy twigs and leaves and very bitter fruit. It occurs in open woodlands all through the mountains up to 12,000 feet elevation. It has not, thus far, been successfully transplanted by the writer.

DOGWOOD FAMILY (*Cornaceæ*)

Mostly shrubs or small trees with usually opposite, simple leaves and small flowers crowded into flat-topped or rounded clusters terminating the new growth. The

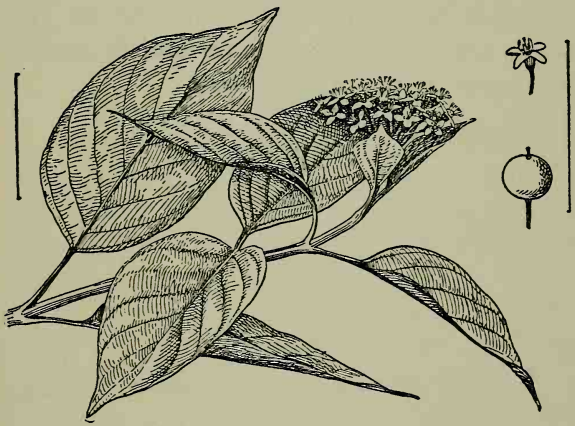


FIG. 106. Red Osier, Dogwood (*Cornus stolonifera*)

fruit is drupe-like or berry-like and in our species, white or lead-colored when ripe. Two species of shrubs occur in our range.

1. Red Osier, Dogwood (*Cornus stolonifera*). A rather common shrub along streams

and in moist half-shaded ground through Colorado, Wyoming and eastward. The smooth stems become bright purplish-red in winter, making it an attractive shrub for the landscape border. It suckers rather freely and is easily transplanted. The fruit is whitish or lead-colored.

2. Bailey's Dogwood (*Cornus Baileyi*). Has the same range and habits as the preceding species. It differs from the former in its somewhat woolly young growth and in the flattened stone of the white fruit. Its stems are brownish in winter and it may be employed as the other species.

HEATH FAMILY (*Ericaceæ*)

The members of this family, in our region, are all low tufted, trailing or creeping shrubby plants with simple, mostly evergreen leaves; flowers with 4 to 5 parted calyx, free from the ovary, united petals and stamens with elongated anther cells which open at the tips to discharge their pollen; fruit a 2 to 5-celled capsule or berry.

Key

a. Fruit a dry capsule; erect bog plants. b.
b. Corolla saucer-shaped with 10 sacs for the anthers. 1. *Kalmia*
b. Corolla bell-shaped or urn-shaped, without sacs for the anthers. c.
c. Leaves evergreen; linear and heath-like. 2. *Phyllodoce*
c. Leaves deciduous; oblong or oval. 3. *Menziesia*
a. Fruit berry-like; stems prostrate or trailing. d.
d. Calyx fleshy, surrounding the pistil when ripe. 4. *Gaultheria*
d. Calyx not fleshy, nor surrounding the pistil. 5. *Arctostaphylos*

1. Pale Laurel (*Kalmia polifolia*). A dwarfish shrub from 4 to 20 inches tall with 2-edged twigs, opposite leathery evergreen leaves and saucer-shaped pinkish purple corollas about ½ inch across. It grows in boggy places in the mountains mostly be-

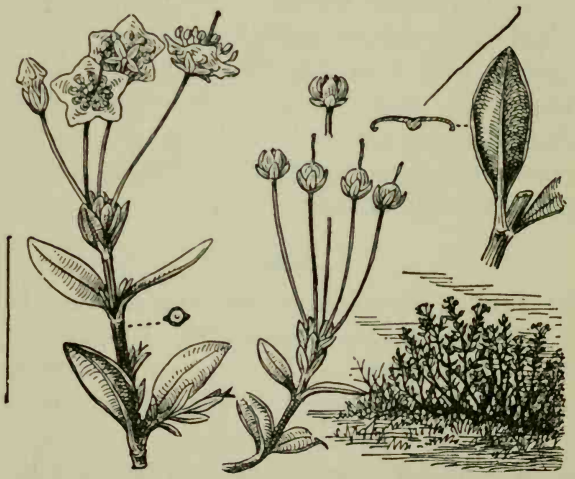


FIG. 107. Pale Laurel (*Kalmia polifolia*)

tween 10,000 and 11,000 feet elevation from Colorado northward across the continent.

2. Mountain Heath (*Phyllodoce empetriformis*). A low, densely branched often matted shrub up to 20 inches tall with alternate, leathery evergreen leaves, with rolled edges, and small bell-shaped rose-colored flowers. It grows in swampy or moist ground

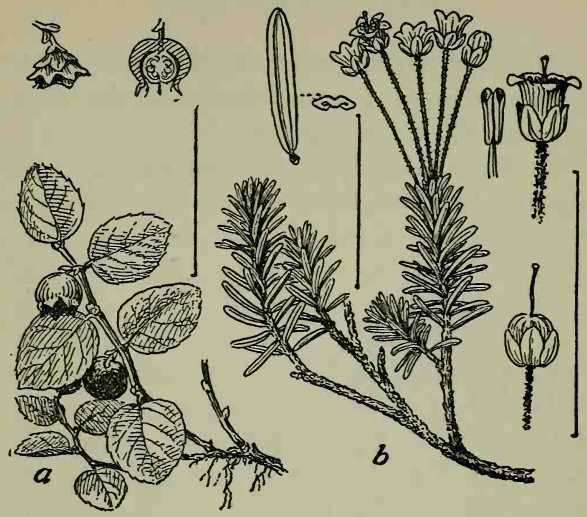


Fig. 108. (*a*) Creeping Wintergreen (*Gaultheria humifusa*). (*b*) Mountain Heath (*Phyllodoce empetriformis*)

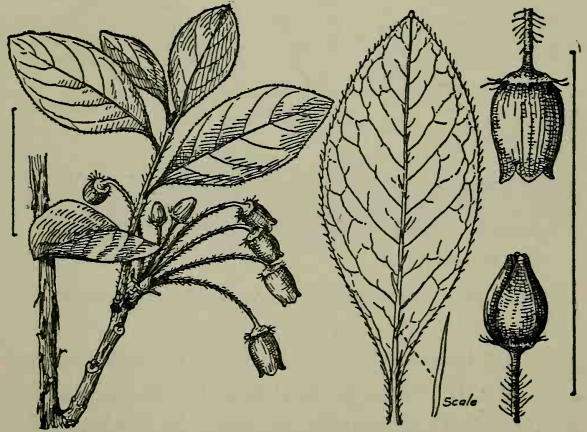


Fig. 109. Menziesia (*Menziesia ferruginea*)

in the sub-alpine zone in the mountains from Colorado northward to Alaska and westward to California.

3. Menziesia (*Menziesia ferruginea*). A shrub 3 to 6 feet tall with deciduous leaves

FIG. 110. Kinnikinnick (*Arctostaphylos uva-ursi*)

more or less coated with rusty brown scales. The small flowers are nearly globular in shape and greenish purple in color. It

occurs from Yellowstone Park to Oregon and Alaska.

4. Creeping Wintergreen (*Gaultheria humifusa*). A very low depressed, green-stemmed shrubby plant with rounded, evergreen leaves and white or pinkish flowers followed by scarlet berries. It grows in woodlands in the sub-alpine zone from Colorado northward and westward.

5. Bearberry, Kinnikinnick (*Arctostaphylos uva-ursi*). This is a common trailing vinelike shrub all through the mountains up to 10,000 feet elevation growing chiefly on wooded slopes and among rocks. Its leaves are evergreen, about 1 inch long, thick, leathery and narrowed toward the base. The small urn-shaped flowers are white or pink and the berries red.

HUCKLEBERRY FAMILY
(*Vacciniaceæ*)

The shrubs of this family closely resemble those of the Ericaceæ from which they differ chiefly in their deciduous instead of evergreen leaves, in our species, and in having the calyx united with the ovary to form the berry. Our species all belong to the genus *Vaccinium*.

Key

a. Flowers in clusters of 2 to 4.
1. *V. occidentale*

a. Flowers solitary. b.

b. Plants mostly less than 1 foot tall. c.

c. Branches not angled.
2. *V. cæspitosum*

c. Branches angled. d.

d. Berries purplish-black; leaves ½ inch long or more.
3. *V. oreophilum*

d. Berries red; leaves less than ½ inch long.
4. *V. scoparium*

b. Plants taller, up to 3 feet; berries black.
5. *V. membranaceum*

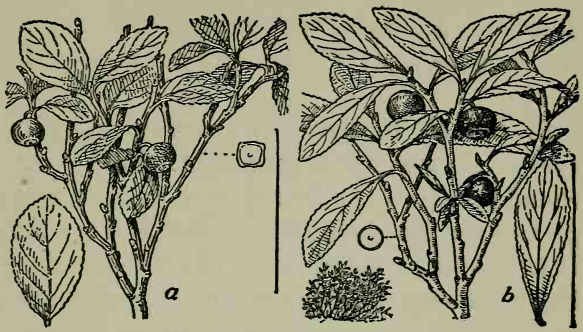


FIG. 111. (*a*) Mountain Bilberry (*Vaccinium oreophilum*) (*b*) Dwarf Bilberry (*Vaccinium caespitosum*)

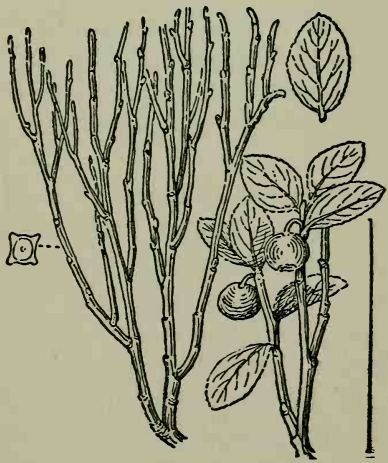


FIG. 112. Small-leaved Bilberry (*Vaccinium scoparium*)

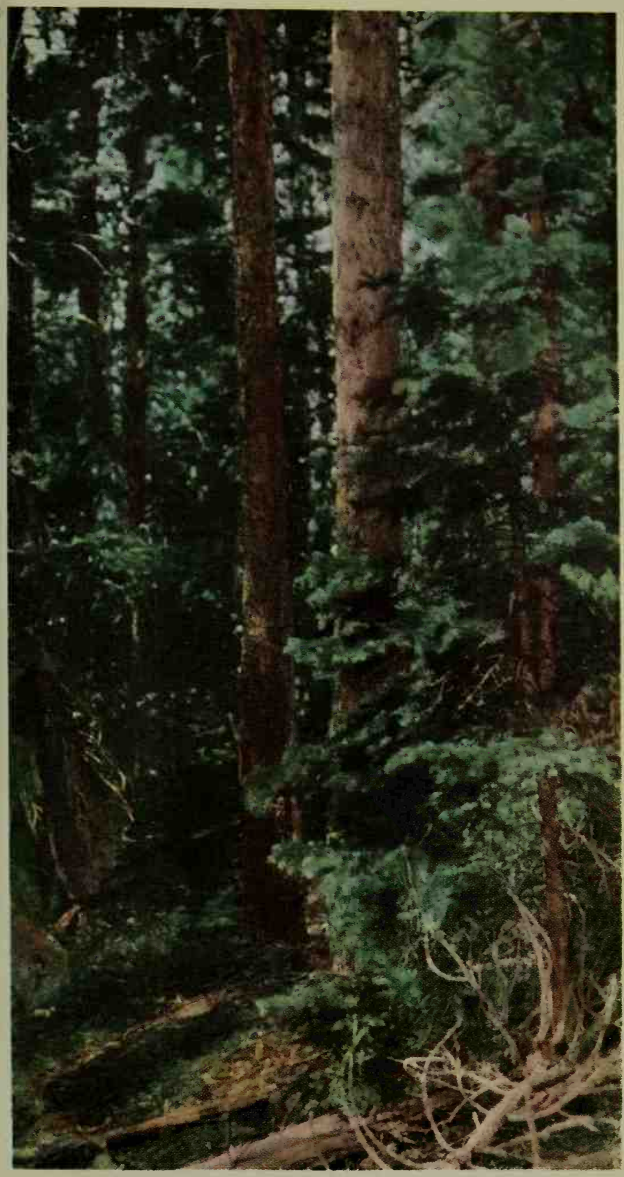
1. Western Huckleberry (*Vaccinium occidentale*). A shrub 1 to 3 feet tall coming into the mountains of Wyoming from the northwest.

2. Dwarf Bilberry (*Vaccinium cæspitosum*). A low tufted upright shrub with round branches and leaves ½ to ¾ inch long; pink or red flowers and blue-black edible fruit. It is a common small shrub of the forest floor in the mountains of the northwest and southward into Colorado where it occurs between 8,000 and 12,000 feet elevation.

3. Mountain Bilberry (*Vaccinium oreophilum*). A low branched shrub mostly less than one foot tall growing in the mountains up to 12,000 feet elevation as far south as New Mexico. It differs from the dwarf bilberry chiefly in its 4-angled stems and its somewhat larger size.

4. Small-leaved Bilberry (*Vaccinium scoparium*). This common little shrub of the sub-alpine forests often grows in dense patches a few inches tall. The very slender stems are green, angled and erect and give the plant a broomlike appearance. The leaves are the smallest of our species being about ⅓ inch long. The small berries are bright red and edible.

5. Tall Bilberry (*Vaccinium membranaceum*). This, the tallest of the species of



VIII. ENGELMANN SPRUCE FOREST

In the sub-alpine zone

the region, reaches northern Wyoming from the northwest. Its habits are similar to the other species, the fruit is blue-black and edible.

OLIVE FAMILY (*Oleaceæ*)

Shrubs or trees with opposite simple or pinnately compound leaves without stipules; flowers usually small, 2 to 4 parted, calyx and ovary separate and fruit dry or fleshy.

Key

Fruit dry, winged; leaves compound (simple in species 2). 1. *Fraxinus*

Fruit fleshy, a drupe; leaves simple. 2. *Forestiera*

Ash (*Fraxinus*)

Trees with strong tough wood, pinnately compound leaves (rarely simple), small flowers without petals, staminate and pistillate on separate trees, and narrow, seed-like, wing-margined fruits.

1. Green Ash (*Fraxinus pennsylvanica* var. *lanceolata*). A tree occasionally 60 feet tall with rounded crown, narrow-ridged scaly bark on old trunks, smooth and reddish on the branches. The leaves are 6 to 12

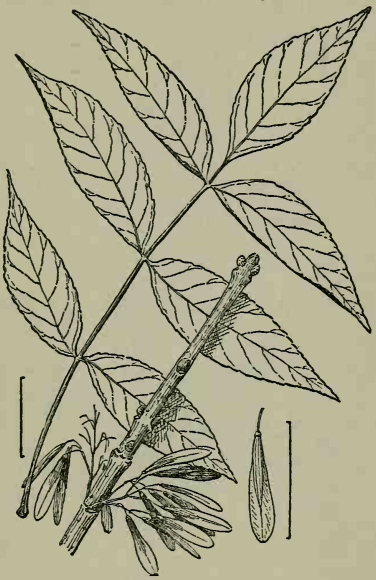


FIG. 113. Green Ash (*Fraxinus pennsylvanica* var. *lanceolata*)

inches long with 5 to 7 leaflets bright green on both sides. The fruits are usually about 1¼ inches long with slender body and narrow wing margin toward the apex. Along

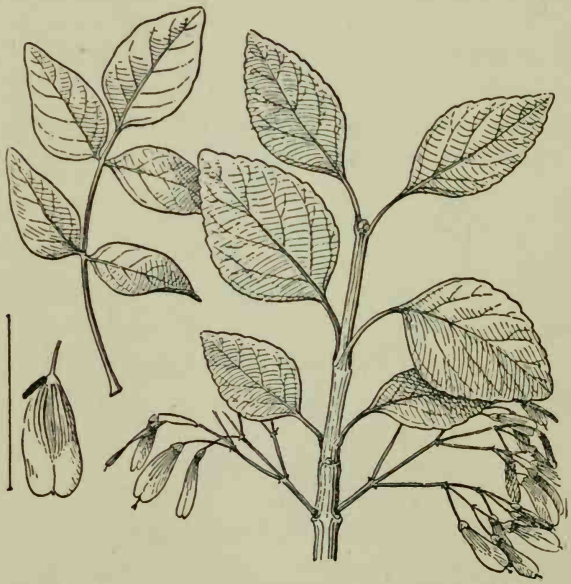


Fig. 114. Simple-leaved Ash (*Fraxinus anomala*)

streams, coming into eastern Wyoming along the Platte river. This tree is extensively planted as a shade tree in the plains region.

2. Simple-leaved Ash (*Fraxinus anomala*). A small shrubby tree 10 to 20 feet tall growing in canyons of southern Colorado, Utah, New

Mexico and Arizona. This unusual species has mostly simple, occasionally compound leaves, and fruits with the wing extending their full length.

New Mexican Forestiera (*Forestiera neo-mexicana*). A shrub 3 to 10 feet tall growing

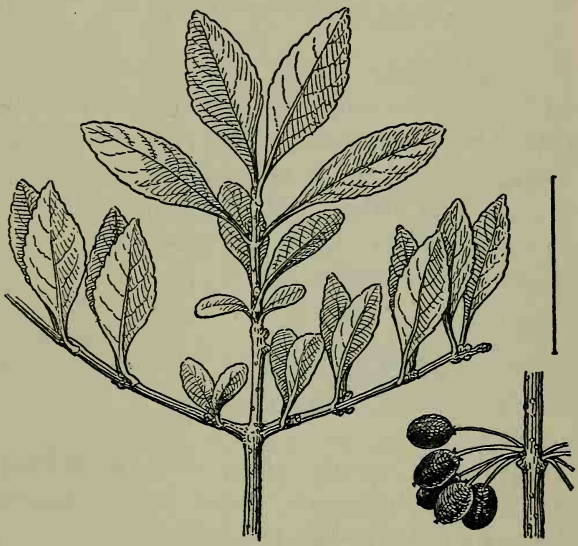


FIG. 115. Forestiera (*Forestiera neo-mexicana*)

on hillsides from southern Colorado into New Mexico and Texas. The simple leaves are about 1 inch long, smooth and narrowed into a short petiole. The flowers are small and the fruits are dark colored drupes.

NIGHT-SHADE FAMILY
(*Solanaceæ*)

A large family, chiefly of herbaceous plants with alternate simple leaves, perfect flowers with 5-lobed calyx and corolla, 5 stamens and mostly 2-celled ovary and fruit free from the calyx. The fruit is either a berry or a dry pod or capsule. Only one genus of shrubs occurs in this region.

MATRIMONY VINE
(*Lycium*)

Shrubs or woody vines with somewhat spiny stems, alternate entire leaves, showy flowers and berry-like red fruits.

Of the four species which occur in the southern Rocky Mountains, and westward, the following is the common one for our range:

Pale Matrimony Vine (*Lycium pallidum*). A somewhat spiny shrub 2–4 feet tall, growing on dry rocky hillsides from southwestern

Colorado to Utah, Texas, Arizona and California. The corolla is yellowish with purplish tints and the berries are red.

FIG. 116. Pale Matrimony Vine (*Lycium pallidum*)

HONEYSUCKLE FAMILY
(*Caprifoliaceæ*)

Mostly shrubs having opposite leaves without stipules; flowers perfect, the calyx and ovary united, corolla 5-lobed or parted, usually 5 stamens and a 2- to 5-celled berry, drupe or capsule.

Key

a. Leaves simple. b.
b. Fruit a drupe with 1 flattened stone or pit. 1. *Viburnum*
b. Fruit berry-like with 2 or more seeds. c.
c. Corolla regular in shape; berry 2-seeded. 2. *Symphoricarpos*
c. Corolla irregular in shape; berry more than 2-seeded. 3. *Lonicera*
a. Leaves pinnately compound. 4. *Sambucus*

1. Arrow-wood, Snowball (*Viburnum*)

Ours are shrubs with flat-topped clusters of white flowers and red or black fruit with a single, flat stone or pit.

Key

Leaves pinnately veined; fruit blue-black.
1. *V. lentago*

Leaves palmately veined; fruit red.
2. *V. pauciflorum*

FIG. 117. Arrow Wood (*Viburnum pauciflorum*)

1. Black Haw (*Viburnum lentago*). A tall shrub or sometimes a small tree with finely toothed margin and oval, blue-black, edible fruit. It occurs along streams and in woods coming into our region from the north and has been recorded as far south as Boulder, Colorado.

2. Arrow-wood, Withrod (*Viburnum pauciflorum*). A straggling shrub 1 to 5 feet tall growing in woods and near streams on moist ground in the mountains up to 9,000 feet elevation. Its leaves are usually 3-lobed and toothed on the margin. The small white flowers are in small clusters at the top

of the stems and are followed by red, acid fruits. It extends from Colorado northward and eastward into Canada and west to Alaska.

2. Snowberry, Buckbrush, Wolfberry (*Symphoricarpos*)

The shrubs of this genus are low but erect and branching, with short-stalked leaves which are entire or wavy-margined, or somewhat lobed on vigorous shoots. The flowers are pinkish white and borne in small clusters. The berries are white or red and often last into the winter. Each of the four species in our region possesses one variety. All are adapted to cultivation.

Key

a. Corolla short bell-shaped, about ⅛ inch long. b.
b. Leaves thick; stamens and style protruding. 1. *S. occidentalis*
b. Leaves rather thin; stamens and style not protruding. 2. *S. racemosus*
a. Corolla long bell-shaped or nearly tubular; ¼ to ½ inch long. c.
c. Leaves finely pubescent, rounded. 3. *S. rotundifolia*
c. Leaves glabrous or nearly so, oval and pointed. 4. *S. oreophilus*

1. Wolfberry (*Symphoricarpos occidentalis*). A common low shrub 1 to 3 feet tall, growing along streams and on hillsides up to 8,000 feet elevation, extending from Colorado northward into Canada. Berries white.

FIG. 118. Wolfberry (*Symphoricarpos occidentalis*)

2. Snowberry (*Symphoricarpos racemosus*). Shrub similar to the preceding species but with thinner leaves with commonly entire margin, and fewer flowers. The berries are globular and white. Variety pauciflorus is smaller and fewer-flowered than the species.

3. Round-leaved Snowberry (*Symphoricarpos rotundifolius*). Shrub 2 to 3 feet tall with small rounded leaves and flowers about

⅓ inch long. The berries are globular or oblong and white. Less frequent than the preceding species but occurring throughout our region. The variety vaccinioides has pubescent leaves, oval to lanceolate in shape, and shorter flowers than the species. It occurs through the mountains in our region.

4. Mountain Snowberry (*Symphoricarpos oreophilus*). A low or erect slender shrub up to 5 feet tall with small, usually entire-margined leaves and tubular or funnel-shaped flowers ⅓ to ½ inch long, and white oblong berries. It grows on wooded slopes in the higher mountains up to 10,000 feet elevation. Variety utahensis has larger leaves and more numerous flowers than the species but is similar in other respects.

The Coral-berry (*Symphoricarpos vulgaris*) which differs from the other species in having densely clustered red berries which remain on through the winter, has been recorded as occurring near Manitou, Colorado.

3. Honeysuckle (*Lonicera*)

Erect shrubs or woody twining vines with opposite entire leaves and showy flowers in terminal clusters or borne at the base of the leaves in pairs. The corolla is often swollen on one side and more or less two-lipped or irregular. The fruit is a berry

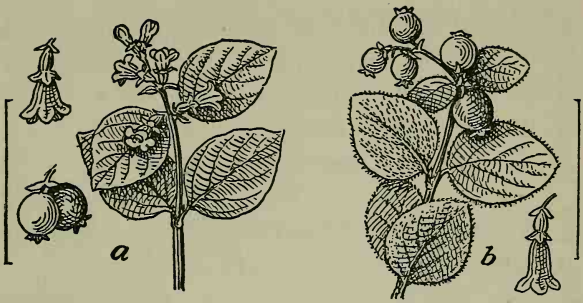


FIG. 119. (*a*) Snowberry (*Symphoricarpos racemosus*). (*b*) Round-leaved Snowberry (*Symphoricarpos rotundifolius*)

FIG. 120. Mountain Snowberry (*Symphoricarpos oreophilus*)

Key

a. Stems climbing or spreading; flowers in head-like clusters. 1. *L. glaucescens*
a. Stems erect; flowers in pairs. b.
b. Flower bracts small or wanting. c.
c. Leaves pale; berries blue-black. 2. *L. cærulea*
c. Leaves green; berries red. 3. *L. utahensis*
b. Flower bracts enlarged and leafy. 4. *L. involucrata*

The first three species occur only in the northernmost part of our region in rocky woods and on moist mountain sides. The flowers are yellow and are followed by berries in pairs with the minute calyx at the tip.

4. Involucred Honeysuckle (*Lonicera involucrata*). A very common erect shrub 2 to 6 feet tall with oval, pointed leaves 2 to 4 inches long and yellowish corollas with large, leafy bracts at the base. After the corollas drop the bracts enlarge and become purplish with the two shiny black berries in the center. It occurs all through the mountains in moist woods up to 9,000 feet elevation. It does well under cultivation.

Elder (*Sambucus*)

The elders are chiefly shrubs, occasionally trees, with erect stems containing large

pith, opposite pinnately compound leaves, small white flowers in compound, terminal clusters and small berries containing 3 bony seeds. They possess a strong, rank odor

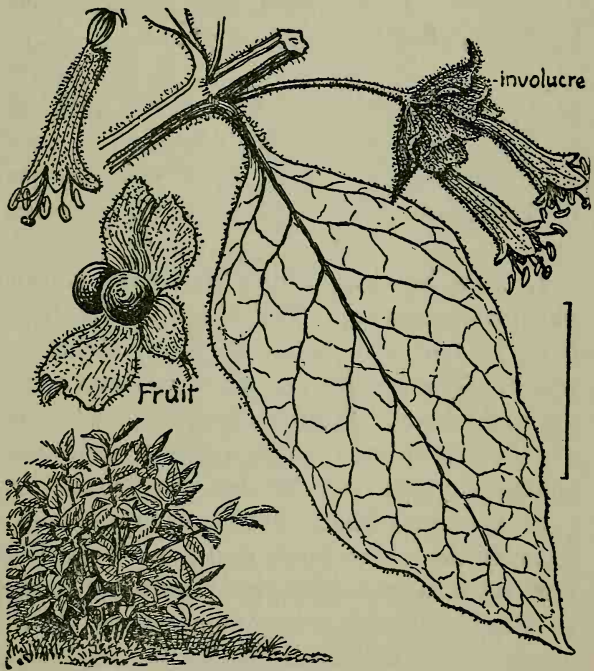


FIG. 121. Involucred Honeysuckle (*Lonicera involucrata*)

when bruised. Some of them are used for onamental planting in the shrub border. The fruit of some kinds is edible.

Key

a. Flower cluster flat-topped; pith of young stems white. b.
b. Stems treelike; fruit blue-black.
1. *S. glauca*, var. *neo-mexicana*
b. Stems shrubby; fruit purple-black.
2. *S. canadensis*
a. Flower cluster not flat-topped; pith of young stems yellowish brown. c.
c. Fruit black. 3. *S. melanocarpa*
c. Fruit red 4. *S. racemosa*

1. New Mexican Elder (*Sambucus glauca* var. *neo-mexicana*). Tall shrub, or treelike, 6 to 12 feet tall, with long-lived stems or trunk. The berries are black covered with a bluish bloom. It grows in the upper levels of the mountains from central Colorado southward into New Mexico and Arizona.

2. Common Elder (*Sambucus canadensis*). This is the elder bush found all over the northeastern part of the continent and south to Florida. It is a common weedy shrub along fences and roadsides in the east but is confined to the mountains of our region where it is infrequent. Its fruit is edible and is quite extensively used in cooking and for flavoring jellies.

3. Black-berried Elder (*Sambucus melano-*

carpa). A shrub of infrequent occurrence in the mountains of Colorado and northwestward.

4. Red-berried Elder (*Sambucus racemosa*). This is the common elder of the higher moun-

FIG. 122. Red-berried Elder (*Sambucus racemosa*)

tains throughout the region. It grows in woodlands and on moist hillsides between elevations of 7,500 to 12,000 feet and is readily recognized by its red berries in rather small clusters. (*S. microbotrys* of some authors.)

SUNFLOWER OR COMPOSITE FAMILY (*Compositæ*)

Plants with chiefly minute flowers (florets) crowded together in dense clusters or heads and surrounded by a calyx-like circle (involucre), of more or less leafy or chafflike scales or bracts, the whole appearing like one flower.

The florets are of two kinds: ray florets and disk florets. In the ray florets the corolla is a single flat piece like a small tube that has been slit open and spread out toward one end. In the disk florets the corolla is commonly tubular or funnel-shaped with 5 teeth or lobes at the summit. The calyx is represented by small scales, bristles or hairs (pappus) growing around the base of the corolla, or it may be entirely lacking. Both calyx and corolla stand on top of the ovary. The stamens are commonly 5 and united by their anthers or they may be lacking especially in the ray florets.

The ovary ripens into a dry, seed-like fruit which bears the pappus, when present, upon

IX. WIND TIMBER AT TIMBER LINE

its summit. In some species the ray florets form the outermost circle while the center of the head is filled with disk florets. In others the whole head may consist of one kind of floret.

This is the largest family of flowering plants in the region and contains more than 100 genera in our region alone. Eight of these are made up wholly or in part of woody-stemmed plants. The family as a whole is quite easy to recognize but the genera and species are exceedingly difficult to separate by any but the trained botanist.

The following genera contain species which are sufficiently woody to be properly classed as shrubs.

a. Leaves without sagelike odor and taste. b.
b. Bracts of the involucre 10 or more, not stiff and woolly. c.
c. Stems smooth; flowers yellow, perfect. 1. *Chrysothamnus*
c. Stems striate or ribbed; flowers white, or yellowish-white, imperfect. 2. *Baccharis*
b. Bracts of the involucre 4 to 6, stiff and woolly. 3. *Tetradymia*
a. Leaves with strong sagelike odor and taste. 4. *Artemisia*

1. Rabbit Brush, False Goldenrod (*Chrysothamnus*)

Shrubby or partly woody plants with naked, often shiny white, or somewhat woolly stems and leaves, the latter narrow and entire; flower heads numerous with narrow involucres and containing 5 to 30 disk florets with golden yellow corollas. The seedlike fruits (achenes) are pubescent and bear a tuft of dull white hairs (pappus). The plants of this genus have recently been investigated as a possible commercial source of rubber, a substance which they contain in small amounts.

A large and difficult genus containing nearly 20 species in our region. The following common species well represents the genus:

Common Rabbit Brush (*Chrysothamnus graveolens*). A common bushy plant 2 to 5 feet tall with numerous whitish slender branches clustered upon the woody rough-barked older stems. The leaves are slender, 2 to 3 inches long and sharp-pointed.

The flower heads are produced in dense clusters at the tips of the new growth and often persist until winter in a flowering condition. Growing on the plains and up to elevations of 8,000 feet throughout the region, commonly on dry ground.

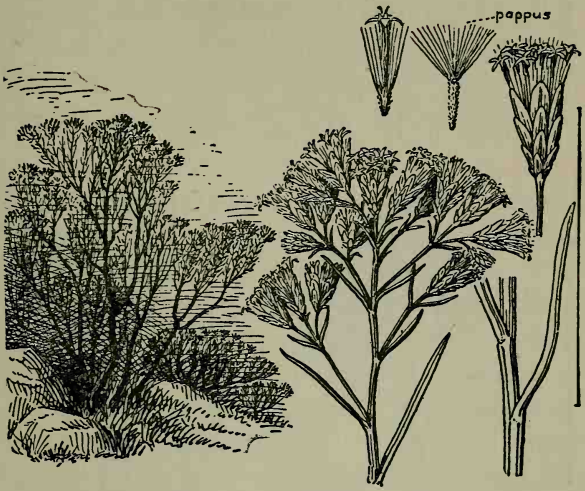


FIG. 123. Rabbit Brush (*Chrysothamnus graveolens*). Flower head; flower; fruit

2. GROUNDSEL TREE, PENCIL TREE (*Baccharis*)

More or less shrubby plants with simple alternate leaves and branches with narrow ribs or striations. Flower heads with imperfect flowers, the staminate and pistillate heads on distinct plants; achenes striate-ribbed and bearing long crinkled-bristly pappus hairs. Two of our species are woody only at the base while the third and fourth are shrubs.

Willow-leaf Baccharis (*Baccharis salicina*). A branching shrub 3 to 12 feet tall growing

in saline soil in the plains zone from Kansas and Texas to Colorado and New Mexico.

Emory's Baccharis (*Baccharis Emoryi*). An erect shrub with slender branches, ob-

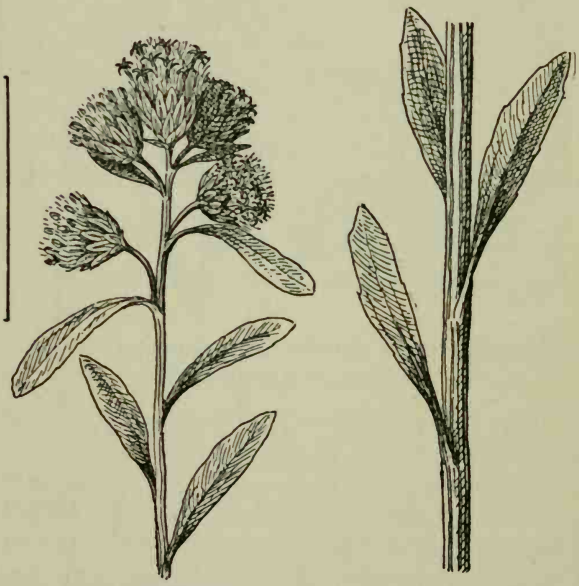


FIG. 124. Willow-leaf Baccharis (*Baccharis salicina*)

long leaves and flower heads with blunt outer scales. Its range is like that of the preceding species.

3. TETRADYMIA

Low branching shrubs with woolly-hairy twigs and leaves. Flower heads with 4 to

6 large, stiff woolly scales, and 4 to 9 yellow disk florets. The achenes are densely covered with long white hairs. The two following species which come well within our range are representative of the species:

Plant without spines.	1. *T. inermis*
Plant spiny.	2. *T. spinosa*

1. Smooth Tetradymia (*Tetradymia inermis*). A spreading shrubby plant with erect

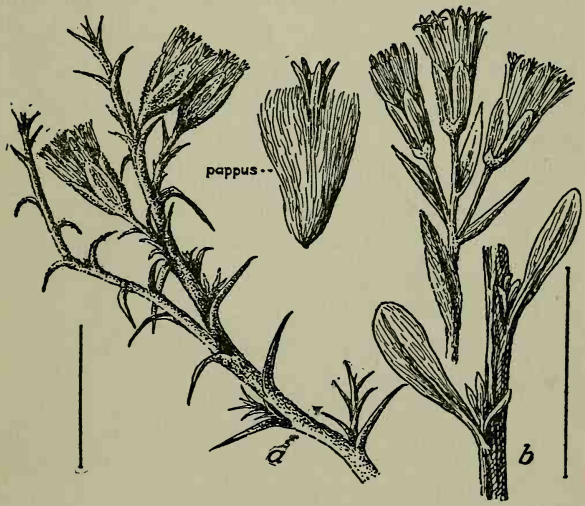


FIG. 125. (*a*) Spiny Tetradymia (*Tetradymia spinosa*). (b) Smooth Tetradymia (*Tetradymia inermis*)

tufted branches from a woody base. Growing on dry hills up to 9,000 feet elevation.

2. Spiny Tetradymia (*Tetradymia spinosa*). A stiffly-branched shrub 2 to 4 feet tall with white woolly twigs and curved, spinelike leaves. Growing on dry hills along the western slope of the mountain range.

4. Sagebrush, Wormwood (*Artemisia*)

Herbs or shrubs with bitter taste and aromatic sagelike odor; leaves alternate, simple, entire, or toothed, lobed or parted into linear divisions. Flower heads small with few to many minute whitish or yellow disk florets. Achenes minute, without pappus.

The whole plant is commonly gray-green in color due to the presence of fine silky or woolly hairs. A large and difficult genus, with more than twenty-five species and several varieties in our region.

The following are representative of the shrubby species:

a. Leaf blades deeply 3-cleft or parted into very narrow segments. b.
b. Leaf segments filiform. 1. *A. filifolia*
b. Leaf segments linear. 2. *A. trifida*
a. Leaf blades entire or 3-toothed at apex. c.

c. Shrub low; leaves linear and mostly entire. 3. *A. cana*

c. Shrub medium to tall; leaves 3-lobed at apex. 4. *A. tridentata*

1. Thread-leaved Sage (*Artemisia filifolia*). Shrubby at the base, with slender

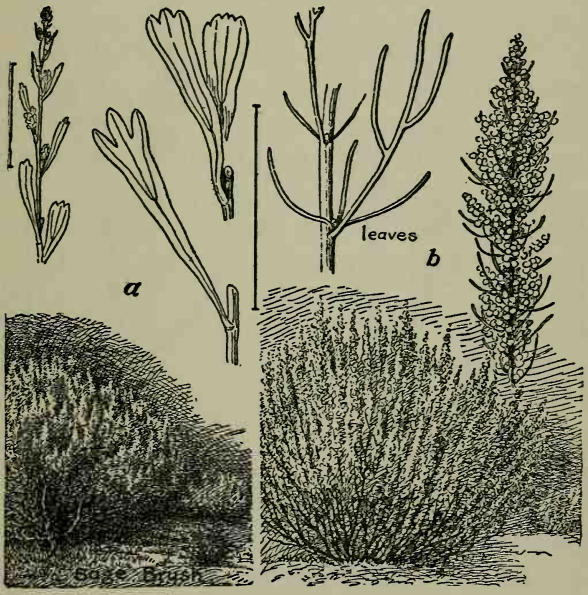


FIG. 126. (*a*) Sage Brush (*Artemisia tridentata*). (*b*) Thread-leaved Sage (*Artemisia filifolia*)

nearly erect white-hairy branches 1 to 2 feet high and 3-parted leaves with threadlike divisions. Common on dry plains from

Nebraska and Wyoming to Texas and Arizona.

The Mountain Sage (*Artemisia frigida*) differs from the preceding in being only

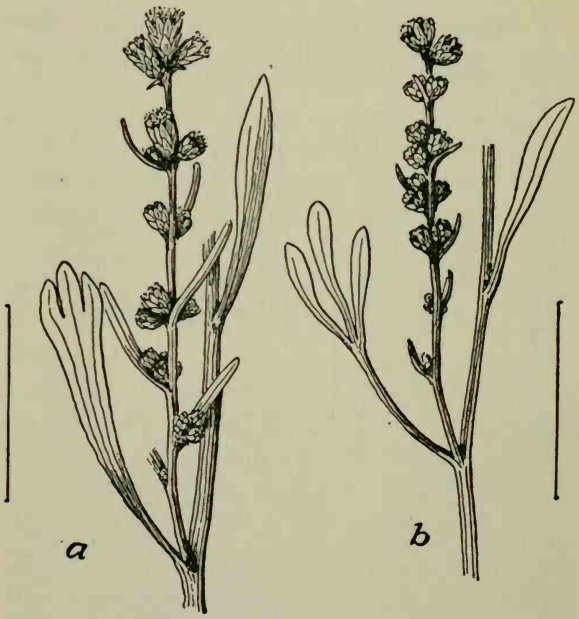


FIG. 127. (*a*) Hairy Sage (*Artemisia cana*). (*b*) Three-lobed Sage (*Artemisia trifida*)

slightly woody at the base and in having nearly simple herbaceous stems and leaves divided two or three times into short linear divisions. The whole plant is covered with soft silky hairs giving it a gray-green effect.

It is a very common plant over the whole of our region and has been employed medicinally under the name of "Rocky Mountain Tea."

2. Three-lobed Sage (*Artemisia trifida*). A silky-hairy, much branched shrubby plant 1 to 2 feet tall with narrow, entire upper and 3-parted lower leaves, the lobes linear or somewhat widened at the apex. On dry elevated plains of the region.

3. Hairy Sage (*Artemisia cana*). A white-hairy, freely branched shrub 1–3 feet tall, with narrow-lanceolate, entire or sometimes 2- or 3-toothed leaves. On dry plains and slopes up to 10,000 feet elevation through the mountains from the north into Colorado.

4. Sagebrush, Black Sage (*Artemisia tridentata*). A shrub 2 to 15 feet tall from the great plains to California and in the mountains up to 9,500 feet elevation. This is the common sagebrush of the dry plains and mountain slopes west of the Missouri river. It often covers extensive areas with a ragged shrubby growth difficult to traverse. Its presence as the dominant vegetation is usually regarded as an indication of a fertile soil.

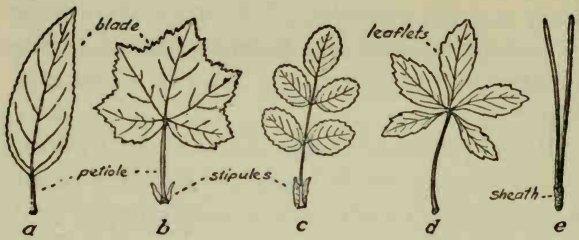


FIG. 128. Forms of leaves. (*a*) Simple, pinnata, lanceolate leaf with serrate margin. (*b*) Simple, palmate, 5-lobed leaf with serrate margin. (*c*) Compound, pinnate leaf with 5 leaflets. (*d*) Compound, palmate leaf with 5 leaflets. (*e*) Needle-like leaves of a pine held together by a sheath at base.

GLOSSARY OF TERMS USED

ALTERNATE. See leaf.

ANTHER. That part of a stamen which contains the pollen.

CATKIN. A more or less elongated flower cluster composed of many small flowers crowded together between little scales. The flowers usually all either staminate or pistillate, as in the willows and cottonwoods and birches.

CALYX. The outer set or circle of parts, sepals, of a flower, usually green in color.

CONELET. A little cone especially in the flowering condition.

COROLLA. The set or circle of parts, petals, just inside the calyx of a flower, usually the largest and showiest part of the flower.

DRUPE. A fruit with a stone or pit enclosed by a fleshy or juicy covering, as in the cherry, plum and hackberry.

ENTIRE. Without teeth, lobes or divisions, as the margin of a leaf.

FILAMENT. The slender stalklike part of a stamen.

FILIFORM. Very slender, threadlike.

GLAND. A small wartlike body or organ which secretes a liquid.

LEAF. The more or less flattened or expanded organ which grows upon the stem of a plant at the nodes. A complete leaf consists of a air of stipules, a stalk or petiole, and a blade, the flattened portion. Some leaves are without stipules and petiole.

Arrangement.—Leaves are alternate when single or one at a node; opposite when in pairs, one on each side of the stem; whorled when three or more come out around the stem at the same node. When a branch is very short and the nodes close together the leaves on it appear in a cluster.

A simple leaf is one with a single blade all in one piece. A compound leaf is one in which the blade is divided into several leaflets all attached to a common petiole.

The veins form the framework of the blade. The principal veins or ribs may branch from along the sides of the central vein or midrib or they may radiate from the upper end of the petiole at the base of the blade. The former are called pinnate leaves, the latter palmate leaves.

The leaves of pines, spruces and firs are needle-shaped while those of the junipers and cedars are either awl-shaped or short and scalelike. In the last case they are flattened against the twig upon which they grow and which they cover.

In some plants the leaves are nearly or wholly wanting as in the joint firs and most cacti.

In such cases the stems are usually green in color and do the work of leaves.

LEAFLET. One of the small blades of a compound leaf.

LINEAR. Very narrow for the width; usually applied to leaves.

LOBED. Cut into or partly divided, as the margin of a leaf.

NODE. The place on the stem which normally bears a leaf and where buds and branches arise.

OPPOSITE. (See leaf.)

OVARY. The lower or basal part of the pistil of a flower within which the ovules and seeds are borne.

OVULE. The little seedlike bodies in the ovary of a flower which become seeds after being fertilized and matured.

PAPPUS. The hairs, bristles or similar appendages at the tip of the seedlike fruits of plants of the sunflower family.

PETAL. One of the parts or divisions of the corolla of a flower.

PETIOLE. The stalk or stem of a leaf.

PISTIL. That part of the flower which contains the ovules and later the seeds and which matures to form the fruit.

PISTILLATE. Having pistils but no stamens, as a pistillate flower.

POLLEN. The fine dustlike powder produced by the stamens of a flower. The fertilization of the ovules, so that they may become seeds, is brought about by the pollen.

POME. A fruit having the structure of an apple or pear. It is sometimes small and berry-like in appearance.

SEPAL. One of the parts or divisions of the calyx.

STAMEN. The organ of the flower which produces the pollen. The parts of the stamen are filament and anther.

STAMINATE. Having stamens but no pistils, as a staminate flower.

STIGMA. The tip of the pistil which receives the pollen during blossoming of the flower.

STIPULE. One of the two small appendages found at the base of the petiole of many leaves. Stipules may be quite large and leaflike or small and scalelike or in some cases they are in the form of prickles.

STYLE. The more or less elongated slender part of the pistil which joins the ovary and the stigma. It is sometimes wanting.

INDEX

A

Abies, 45
Abies arizonica, 48
Abies concolor, 49
Abies lasiocarpa, 46
Acer, 173
Acer glabrum, 173
Acer grandidentatum, 175
Acer negundo, 175
Aceraceæ, 173
Alder, 88
Almond Willow, 79
Alnus, 88
Alnus tenuifolia, 88
Amelanchier, 145
Amelanchier Bakeri, 148
Amelanchier elliptica, 146
Amelanchier oreophila, 148
Amelanchier prunifolia, 148
Amelanchier spicata, 146
Amorpha, 160
Anacardiaceæ, 168
Andrews' Birch, 90
Antelope Brush, 132
Apple Family, 144
Apple, Thorn, 148
Arceuthobium, 98
Arceuthobium americanum, 98
Arceuthobium cryptopodum, 98
Arceuthobium cyanocarpum, 98
Arceuthobium divaricatum, 98
Arctostaphylos uva-ursi, 203
Arrow-wood, 215
Artemisia cana, 233
Artemisia filifolia, 231
Artemisia frigida, 232
Artemisia tridentata, 234
Artemisia trifida, 233
Ash, Green, 208
Ash, Mountain, 152
Aspen, 76
Atriplex canescens, 101
Atriplex confertifolia, 103
Atriplex Nuttallii, 103

B

Baccharis Emoryi, 228
Baccharis salicina, 227
Ball Cactus, 188
Balm, Mountain, 180
Balsam, 46
Balsam Fir, 45
Balsam Poplar, 74
Barberry Family, 109
Barberry, Fendler's, 110
Barberry, Fremont's, 111
Bearberry, 203
Bear Grass, 64
Beech Family, 92
Berberis, 109
Betula, 88
Betulaceæ, 86
Bilberry, 206
Birch, Andrews', 90
Birch, Bog, 90
Birch, Canoe, 90
Birch, Paper, 90
Birch, Rocky Mountain, 88
Black Haw, 215
Blueberry, 206
Blue Spruce, 38
Bossekia, 132

Box Elder, 175
Bristle-cone Pine, 27
Buckbrush, 216
Buckthorn Family, 179
Buffalo Berry, 193, 195
Buttercup Family, 107

C

Cactaceæ, 186
Cactus, Ball, 188
Cactus, Cane, 192
Cactus Family, 186
Cactus, Hedgehog-thistle, 189
Cactus, Pincushion, 188
Cactus, Prickly Pear, 190
Caltrop Family, 163
Canada Buffalo Berry, 196
Caprifoliaceæ, 214
Ceanothus Fendleri, 180
Ceanothus mollisimus, 180
Ceanothus velutinus, 180
Celastraceæ, 172
Celtis occidentalis, 99
Celtis reticulata, 100
Cercocarpus intricatus, 129
Cercocarpus parvifolius, 127
Cereus, 190
Chenopodiaceæ, 101
Cherry, Bird, 156
Cherry, Choke, 155
Cherry, Sand, 157
Chicobrush, 101
China Berry, 178
Chrysothamnus graveolens, 226
Cinquefoil, Shrubby, 140
Clematis, 107
Cliff Rose, 129
Coleogyne ramosissima, 130
Colorado Oak, 94
Colorado Spruce, 38
Compositæ, 224
Cork-bark Fir, 48
Cornaceæ, 197
Cornus Baileyi, 198
Cornus stolonifera, 197
Corylus rostrata, 86
Cottonwood, Broad-leaf, 70
Cottonwood, Lance-leaf, 75
Cottonwood, Narrow-leaf, 70
Cottonwood, Wislizeni's, 70
Covillea tridentata, 163
Cowania mexicana, 129
Crataegus cerronis, 150
Crataegus coloradensis, 151
Crataegus coloradoides, 152
Crataegus Doddsii, 151
Crataegus occidentalis, 152
Crataegus rivularis, 152
Crataegus saligna, 149
Creeping Willow, 84
Creeping Wintergreen, 203
Creosote Bush, 163
Currant, Colorado, 118
Currant, Golden, 120
Currant, Missouri, 120
Currant, Red, 120
Currant, Squaw, 120
Currant, Wolf's, 119

D

Dasiophora fruticosa, 140
Desert Juniper, 54
Dogwood Family, 197
Douglas Fir, 42
Drupaceæ, 154

E

Echinocactus, 189
Echinocereus, 190
Edwinia, 122
Elæagnaceæ, 193
Elæagnus, argentea, 193
Elder, Common, 220
Elder, Red-berried, 223
Elm Family, 99
Engelmann Spruce, 41
Ephedra antisyphilitica, 59
Ephedra Torreyana, 60
Ephedra trifurca, 61
Ericaceæ, 199
Eurotia lanata, 105

F

Fagaceæ, 92
Fallugia paradoxa, 130
False Indigo, 160
False Meadowsweet, 132
False Raspberry, 132
Fendlera rupicola, 125
Fendler's Barberry, 110
Fendler's Willow, 83
Fir, Alpine, 46
Fir, Balsam, 46
Fir, Concolor, 49
Fir, Cork-bark, 48
Fir, Douglas, 44
Fir, Joint, 59
Fir, Red, 44
Fir, White, 49
Forestiera Neo-mexicana, 211
Fraxinus anomala, 210
Fraxinus Pennsylvanica var. *lanceolata*, 208

G

Gaultheria humifusa, 203
Gnetaceæ, 59
Golden Currant, 120
Goldenrod, False, 226
Gooseberry Family, 114
Goosefoot Family, 101
Grape, Oregon, 109
Grape, Wild, 183
Grayia Brandegii, 104
Greasewood, 105
Green Ash, 208
Grossulariaceæ, 114

H

Hackberry, 99
Hawthorn, 148
Hazelnut, 86
Heath Family, 199
Heath, Mountain, 200
Holodiscus dumosus, 132
Honeysuckle Family, 214
Hop-tree, 166
Huckleberry Family, 204
Hydrangea Family, 122
Hydrangeaceæ, 122

I

Ivy, American, 184

J

Jamesia americana, 122
Joint Fir Family, 59
Juniper, Creeping, 54
Juniper, Desert, 54
Juniper, Low, 52
Juniper, Utah, 54
Juniperus communis var. *montana*, 52
Juniperus monosperma, 55
Juniperus prostrata, 54
Juniperus scopulorum, 56
Juniperus utahensis, 54

K

Kalmia polifolia, 200
Kinnikinnick, 203

L

Laurel, Pale, 200
Lead Plant, 160
Leguminoseæ, 159
Liliaceæ, 62
Lily Family, 62
Limber Pine, 30
Locust, New Mexican, 159
Lodgepole Pine, 34
Lonicera cærulea, 220
Lonicera glaucescens, 220
Lonicera involucrata, 220
Lonicera utahensis, 220
Loranthaceæ, 97
Lycium pallidum, 212

M

Mamillaria, 188
Maple Family, 173

Maple, Large-tooth, 175
Maple, Smooth, 175
Matrimony Vine, 212
Meadowsweet, False, 132
Menziesia ferruginea, 202
Missouri Currant, 120
Mistletoe, 97
Mistletoe, Juniper, 98
Mistletoe, Lesser, 98
Mock Orange, 122
Mountain Ash, 154
Mountain Balm, 180
Mountain Bog Birch, 90
Mountain Mahogany, 127
Mountain Maple, 173

N

Narrow-leaf Cottonwood, 70
New Jersey Tea, 180
Nightshade Family, 212
Ninebark, 135
Nut Pine, 36

O

Oak, Colorado, 94
Oak, Scrub, 95
Oak, Utah, 93
Oleaceæ, 208
Oleaster Family, 193
Olive Family, 208
Opulaster, 135
Opuntia arborescens, 192
Opuntia Davisii, 192
Orange, Mock, 122
Oregon Grape, 109

P

Pachystima myrsinites, 172
Pale Laurel, 200
Paper Birch, 90
Parthenocissus, 184
Pea Family, 159
Peach-leaf Willow, 79
Peraphyllum ramosissimum, 144
Philadelphus microphyllus, 124
Philadelphus nitidus, 124
Philadelphus occidentalis, 122
Phorandendron juniperinum, 98
Phyllodoce empetriformis, 200
Physocarpus intermedius, 138
Physocarpus monogynus, 136
Physocarpus pubescens, 136
Physocarpus Ramaleyi, 136
Picea Engelmannii, 41
Picea pungens, 38
Pinaceæ, 25
Pine, Bristle-cone, 27
Pine Family, 25
Pine, Limber, 30
Pine, Lodgepole, 34
Pine, Nut, 36
Pine, Pinyon, 36
Pine, Rock, 32
Pine, Western Yellow, 32
Pinus, 26
Pinus aristata, 27
Pinus contorta var. *Murrayana*, 34
Pinus edulis, 36
Pinus flexilis, 30
Pinus ponderosa var. *scopulorum*, 32
Pinyon Pine, 36
Plum Family, 154
Plum, Wild, 155
Poison Ivy, 170
Pomaceæ, 144
Poplar, 68
Populus acuminata, 75
Populus Andrewsii, 76
Populus angustifolia, 70
Populus balsamifera, 74
Populus Sargentii, 70
Populus tremuloides, 76
Populus Wislizenii, 70
Prunus americana, 155
Prunus Besseyi, 157

Prunus melanocarpa, 155
Prunus pennsylvanica, 156
Pseudotsuga taxifolia, 42
Ptelea crenulata, 166
Purshia tridentata, 132
Pyrus, 152

Q

Quercus Gambellii, 96
Quercus Gunnisonii, 95
Quercus leptophylla, 94
Quercus undulata, 94
Quercus utahensis, 93
Quercus Vreelandii, 95

R

Rabbit Brush, 226
Ranunculaceæ, 107
Raspberry, False, 132
Raspberry, Wild Red, 140
Rhamnaceæ, 179
Rhamnus Smithii, 179
Rhus cismontana, 168
Rhus Rydbergii, 170
Rhus trilobata, 170
Ribes cereum, 120
Ribes coloradense, 118
Ribes lentum, 117
Ribes longiflorum, 120
Ribes parvulum, 118
Ribes saximontanum, 116
Ribes saxosum, 116
Ribes Wolfii, 119
Robinia neo-mexicana, 159
Rock Pine, 32
Rosa arkansana, 142
Rosa Fendleri, 142
Rosa MacDougalii, 142
Rosa Nutkana, 142
Rosa Sayi, 142
Rosa Woodsii, 142
Rosaceæ, 126
Rose, Cliff, 129
Rose Family 126
Rubus deliciosus, 132
Rubus parviflorus, 134
Rubus strigosus, 140
Rutaceæ, 165

S

Sagebrush, 230
Salicaceæ, 67
Salix amygdaloides, 79
Salix exigua, 82
Salix Fendleriana, 83
Salix glaucops, 84
Salix Gyeriana, 82
Salix luteosericea, 82
Salix Nuttallii, 82
Salix petrophila, 84
Salix rostrata, 81
Salix saximontana, 84
Salix stenophylla, 82
Salix Wrightii, 81
Salmonberry, 134
Saltbush, 101
Sambucus canadensis, 222
Sambucus glauca, 222
Sambucus melanocarpa, 222
Sambucus neo-mexicana, 222
Sambucus racemosa, 223
Sand Cherry, 157
Sapindaceæ, 177
Sapindus, 178
Sarcobatus vermiculatus, 105
Service-berry, 145
Shad, 145
Shepherdia argentea, 195
Shepherdia canadensis, 196
Shrubby Cinquefoil, 140
Silver-berry, 193
Skunk-brush, 170
Snowberry, 216
Soapberry, 178
Soapweed, 64
Solanaceæ, 212
Sorbus scopulina, 152
Spanish Bayonet, 64
Spruce, 38
Spruce, Blue, 38
Spruce, Colorado, 38
Spruce, Douglas, 44
Spruce, Engelmann, 41
Spruce, Silver, 38

Squawbush, 170
Squaw Currant, 120
Staff Tree Family, 172
Sumach Family, 168
Sunflower Family, 224
Symphoricarpos occidentalis, 217
Symphoricarpos oreophilus, 218
Symphoricarpos racemosus, 217
Symphoricarpos rotundifolius, 217
Symphoricarpos vulgaris, 218

T

Tetradymia inermis, 229
Tetradymia spinosa, 230
Thamnosma texanum, 166
Thimbleberry, 132
Thorn Apple, 148

U

Ulmaceæ, 99
Utah Juniper, 54

V

Vacciniaceæ, 204
Vaccinium cæspitosum, 206
Vaccinium membranaceum, 206
Vaccinium occidentale, 206
Vaccinium oreophilum, 206
Vaccinium scoparium, 206
Viburnum lentago, 215
Viburnum pauciflorum, 215
Virginia Creeper, 184
Virgin's Bower, 107
Vitaceæ, 183
Vitis vulpina, 183

W

Wafer Ash, 166
White Fir, 49
Wild Gooseberry, 116
Wild Plum, 155
Wild Red Raspberry, 140
Willow, Beaked, 81
Willow Family, 67
Willow, Fendler's, 83
Willow, Glaucous-stemmed, 82
Willow, Gyer's, 82
Willow, Narrow-leaf, 82
Willow, Nuttall's, 82
Willow, Peach-leaf, 79
Willow, Pussy, 82
Willow, Rocky Mountain Creeping, 84
Willow, Sub-alpine, 84
Willow, Western Black, 81
Winter Fat, 105
Wintergreen, Creeping, 203
Wolfberry, 216
Woodbine, 184
Wormwood, 230

Y

Yucca baccata, 66
Yucca glauca, 64
Yucca Harrimaniæ, 66

Z

Zygophyllaceæ, 163

A Selection from the Catalogue of

G. P. PUTNAM'S SONS

Complete Catalogues sent on application

Field Book of American Wild Flowers

By

F. Schuyler Mathews

New Edition. **12°**

Being a Short Description of their Character and Habits, a Concise Definition of their Colors, and Incidental References to the Insects which Assist in their Fertilization. With 24 Reproductions in Water-Color, and Numerous Pen-and-Ink Studies from Nature by the Author.

G. P. Putnam's Sons

New York **London**

Field Book of American Trees and Shrubs

By

F. Schuyler Mathews

Author of "Field Book of American Wild Flowers," "Field Book of Wild Birds and Their Music"

16°. With 120 Illustrations, 16 in Color, and 43 Maps

Uniform with the volumes on "Wild Birds" and "Wild Flowers"

Mr. Mathews's earlier books, dealing with American Wild Flowers and Wild Birds, are a sufficient guaranty that his volume on American Trees and Shrubs will be not only artistic in form but also will possess scientific accuracy and value. The book covers the entire territory of the United States. An important feature is a series of maps showing the habitat of the various species.

New York **G. P. Putnam's Sons** London

Field Book of Western Wild Flowers

By

Margaret Armstrong

16°. Over 600 pages. 500 Black and White, 48 Color, Illustrations

In collaboration with Prof. J. J. Thornber of the University of Arizona and Botanist of the Arizona Agriculture Experiment Station at Tucson.

Bound uniform with the Field Books of Schuyler Mathews. This is the first time that an adequate field book has been presented for the use of flora lovers, living or visiting west of the Rockies. 48 illustrations in color and 500 in black and white supplement the very useful text. Technical and botanical names have been translated into ordinary English.

G. P. Putnam's Sons

New York **London**

The Field Book of Insects

With Special Reference to Those of the Northeastern United States, Aiming to Answer Common Questions

by Frank E. Lutz

Associate Curator, Dept. of Invertebrate Zoölogy, American Museum of Natural History

16°. About 800 Illustrations, Many in Color, by Edna F. Beutenmuller

Flex. clo. Flex. lea.

Hints concerning collecting, breeding, preserving, and classifying insects; "catch characters," rather than lengthy descriptions, by which commonly observed insects, and insects which would repay observation, may be recognized; outlines of interesting or economically important insect life histories; and an untechnical but scientifically accurate text.

Uniform with Schuyler Mathews's books of Birds, Flowers, and Trees.

G. P. Putnam's Sons

New York **London**